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(71) Applicant: **Nissan Chemical Corporation**

Tokyo 103-6119 (JP)

(72) Inventors:

- **TSUJI, Keisuke**
Funabashi-shi, Chiba 274-8507 (JP)
- **KOBAYASHI, Chisato**
Funabashi-shi, Chiba 274-8507 (JP)
- **TAJIMA, Yuki**
Funabashi-shi, Chiba 274-8507 (JP)
- **MIZOYAMA, Yasunori**
Shiraoka-shi, Saitama 349-0294 (JP)

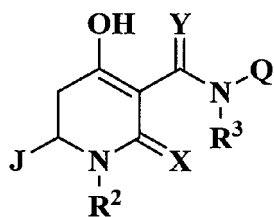
(74) Representative: **Hoffmann Eitle**

Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

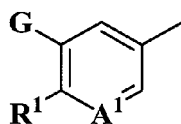
(54) **ARYLTETRAHYDROPYRIDINE COMPOUND AND PEST CONTROL AGENT**

(57) The present invention relates to an aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

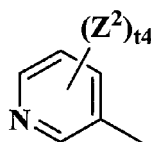
EP 4 582 413 A1



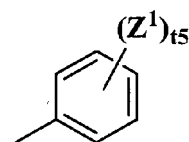
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J-1



G-1



Q-1

wherein Q represents, for example, Q-1, J represents, for example, J-1, G represents, for example, G-1, R¹ represents, for example, halo (C₁-C₆) alkyl, R² represents, for example, a hydrogen atom, R³ represents, for example, a hydrogen atom, X represents, for example, an oxygen atom, Y represents, for example, an oxygen atom, and A¹ represents, for example, a nitrogen atom.

(52) Cooperative Patent Classification (CPC): (Cont.)

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Description

Technical Field

[0001] The present invention relates to novel aryltetrahydropyridine compounds and salts thereof, production intermediates therefor, and a pesticide, an agrochemical, a control agent, an insecticide or acaricide, an agent for seed treatment, and an agent for soil treatment each containing such a compound and/or a salt thereof as an active ingredient.

Background Art

[0002] A certain class of aryltetrahydropyridine compounds is known to exhibit pesticidal activity (for example, Patent Literatures 1, 2).

Document List

Patent Literatures

[0003]

Patent Literature 1: International Publication No. WO 2021/261562

Patent Literature 2: International Publication No. WO 2023/127806

Summary of Invention

Technical Problem

[0004] However, use of chemicals for many years may cause the outbreak of noxious insects and pests that have acquired resistance to existing insecticides. Accordingly, development of a novel chemical having a superior pesticidal effect is always demanded.

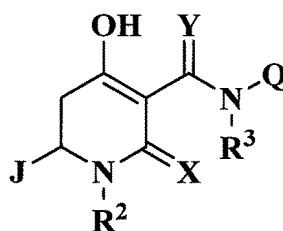
Solution to Problem

[0005] The present inventors have diligently studied for solving the problem to find that novel aryltetrahydropyridine compounds according to the present invention, which are represented by a formula (1) shown below, have superior pesticidal activity, in particular, superior activity for killing insects and killing acarians, and completed the present invention.

[0006] Specifically, the present invention relates to an aryltetrahydropyridine compound represented by the following formula (1) or a salt thereof.

A formula (1):

[Formula 1]



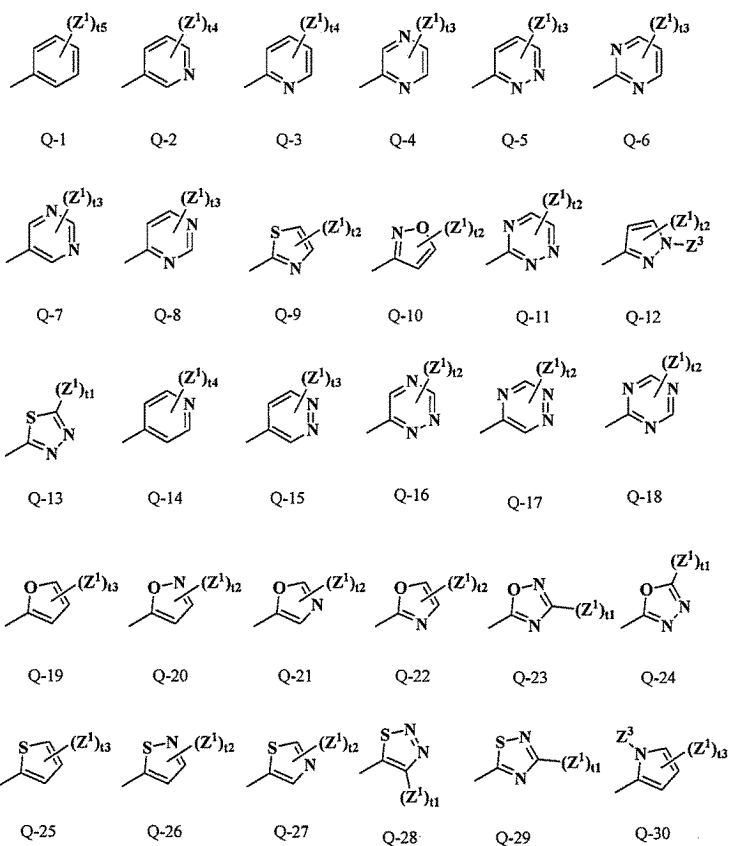
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wherein

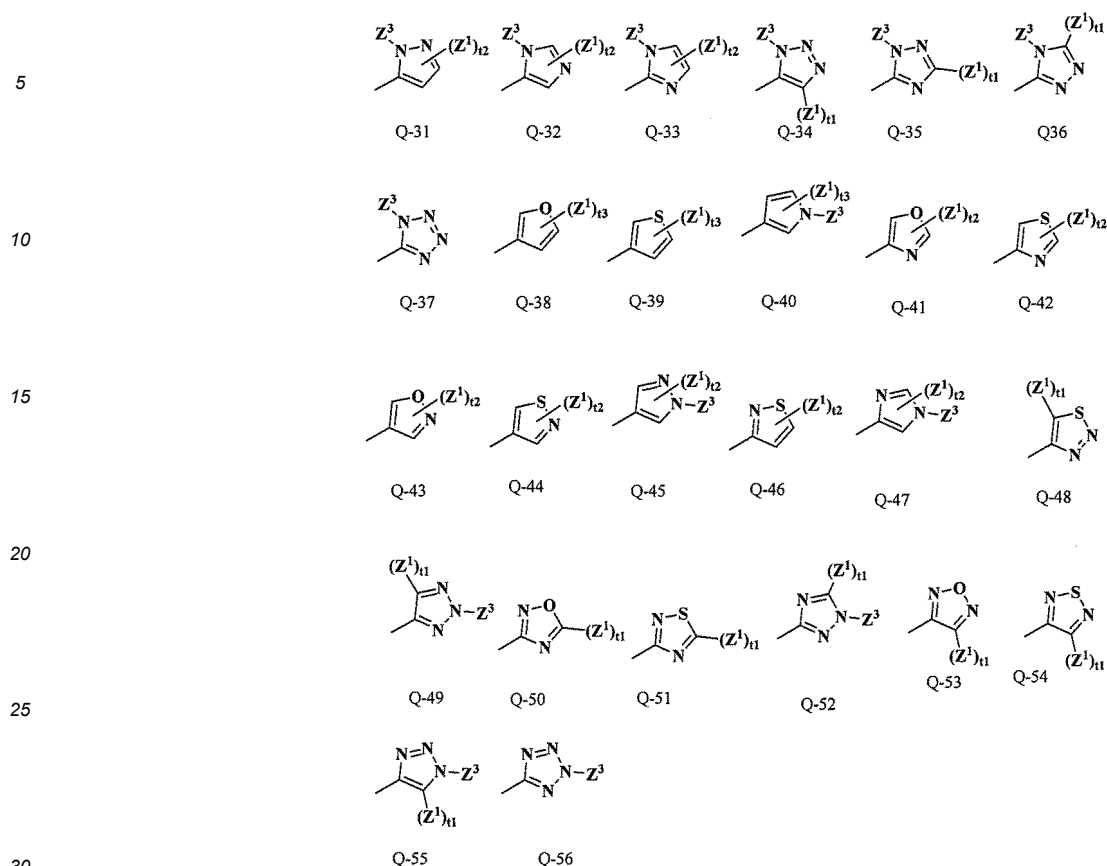
Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-16, Q-17, Q-18, Q-19, Q-20, Q-21, Q-22, Q-23, Q-24, Q-25, Q-26, Q-27, Q-28, Q-29, Q-30, Q-31, Q-32, Q-33, Q-34, Q-35, Q-36, Q-37, Q-38, Q-39, Q-40, Q-41, Q-42, Q-43, Q-44, Q-45, Q-46, Q-47, Q-48, Q-49, Q-50, Q-51, Q-52, Q-53, Q-54, Q-55 or

Q-56,

[Formula 2]



[Formula 3]



Z^1 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, halo (C_1 - C_6) alkyl, halo (C_2 - C_6) alkenyl, halo (C_2 - C_6) alkynyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_2 - C_6 alkoxy (C_1 - C_6) alkoxy, C_2 - C_6 alkenyloxy, halo (C_2 - C_6) alkenyloxy, C_2 - C_6 alkynyloxy, halo (C_2 - C_6) alkynyloxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfanyl, C_1 - C_6 alkylsulfonyl, halo (C_1 - C_6) alkylthio, halo (C_1 - C_6) alkylsulfanyl, halo (C_1 - C_6) alkylsulfonyl, C_2 - C_6 alkenylthio, C_2 - C_6 alkenylsulfanyl, C_2 - C_6 alkenylsulfonyl, halo (C_2 - C_6) alkenylthio, halo (C_2 - C_6) alkenylsulfanyl, halo (C_2 - C_6) alkenylsulfonyl, C_2 - C_6 alkynylthio, C_2 - C_6 alkynylsulfanyl, C_2 - C_6 alkynylsulfonyl, halo (C_2 - C_6) alkynylthio, halo (C_2 - C_6) alkynylsulfanyl, halo (C_2 - C_6) alkynylsulfonyl, $-NH_2$, C_1 - C_6 alkylamino, di (C_1 - C_6) alkylamino, halo (C_1 - C_6) alkylamino, dihalo (C_1 - C_6) alkylamino, formyl, carboxy, C_1 - C_6 alkylcarbonyl, halo (C_1 - C_6) alkylcarbonyl, C_1 - C_6 alkoxy carbonyl, halo (C_1 - C_6) alkoxy carbonyl, C_1 - C_6 alkylaminocarbonyl, halo (C_1 - C_6) alkylaminocarbonyl, di (C_1 - C_6) alkylaminocarbonyl, hydroxy, C_1 - C_6 alkylcarbonyloxy, C_1 - C_6 alkoxy carbonyloxy, C_1 - C_6 alkylsulfonyloxy, halo (C_1 - C_6) alkylsulfonyloxy, $-SO_3H$, C_1 - C_6 alkylaminosulfonyl, di (C_1 - C_6) alkylaminosulfonyl, $-C(=NOR^{12})R^{13}$, cyano or nitro,

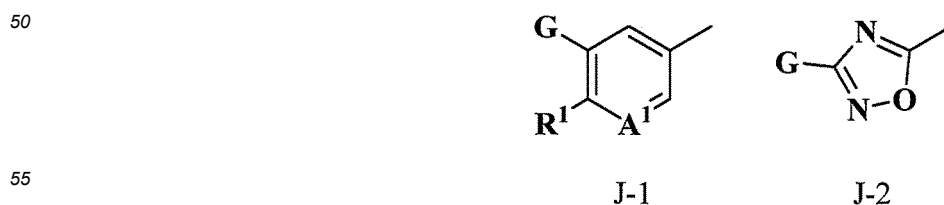
R^{12} represents a hydrogen atom or C_1 - C_6 alkyl,

R^{13} represents a hydrogen atom or C_1 - C_6 alkyl,

Z^3 represents a hydrogen atom or C_1 - C_6 alkyl,

J represents J-1 or J-2,

[Formula 4]

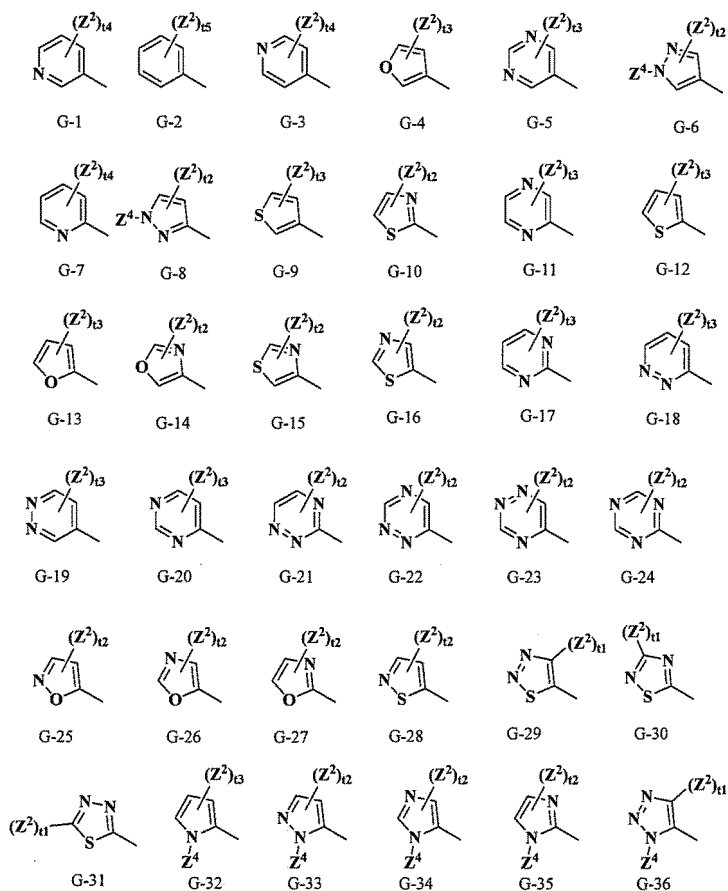


A^1 represents a nitrogen atom or CH,

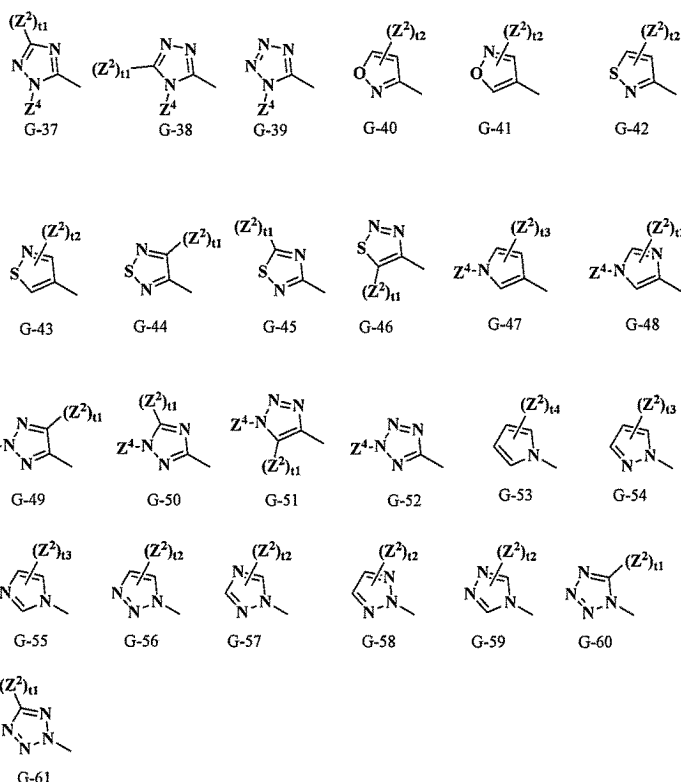
G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18,

G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-36, G-37, G-38, G-39, G-40, G-41, G-42, G-43, G-44, G-45, G-46, G-47, G-48, G-49, G-50, G-51, G-52, G-53, G-54, G-55, G-56, G-57, G-58, G-59, G-60 or G-61,

[Formula 5]



[Formula 6]



Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, halo (C_1 - C_6) alkyl, halo (C_2 - C_6) alkenyl, halo (C_2 - C_6) alkynyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkoxy (C_1 - C_6) alkoxy, C_2 - C_6 alkenyloxy, halo (C_2 - C_6) alkenyloxy, C_2 - C_6 alkynyloxy, halo (C_2 - C_6) alkynyloxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, halo (C_1 - C_6) alkylthio, halo (C_1 - C_6) alkylsulfinyl, halo (C_1 - C_6) alkylsulfonyl, C_2 - C_6 alkenylthio, C_2 - C_6 alkenylsulfinyl, C_2 - C_6 alkenylsulfonyl, halo (C_2 - C_6) alkenylthio, halo (C_2 - C_6) alkenylsulfinyl, halo (C_2 - C_6) alkenylsulfonyl, C_2 - C_6 alkynylthio, C_2 - C_6 alkynylsulfinyl, C_2 - C_6 alkynylsulfonyl, halo (C_2 - C_6) alkynylthio, halo (C_2 - C_6) alkynylsulfinyl, halo (C_2 - C_6) alkynylsulfonyl, $-NH_2$, C_1 - C_6 alkylamino, di (C_1 - C_6) alkylamino, halo (C_1 - C_6) alkylamino, dihalo (C_1 - C_6) alkylamino, formyl, carboxy, C_1 - C_6 alkylcarbonyl, halo (C_1 - C_6) alkylcarbonyl, C_1 - C_6 alkoxycarbonyl, halo (C_1 - C_6) alkoxycarbonyl, C_1 - C_6 alkylaminocarbonyl, halo (C_1 - C_6) alkylaminocarbonyl, di (C_1 - C_6) alkylaminocarbonyl, hydroxy, C_1 - C_6 alkylcarbonyloxy, C_1 - C_6 alkoxycarbonyloxy, C_1 - C_6 alkylsulfonyloxy, halo (C_1 - C_6) alkylsulfonyloxy, $-SO_3H$, C_1 - C_6 alkylaminosulfonyl, di (C_1 - C_6) alkylaminosulfonyl, $-C(=NOR^{14})R^{15}$, nitro or cyano,

R^{14} represents a hydrogen atom or C_1 - C_6 alkyl,

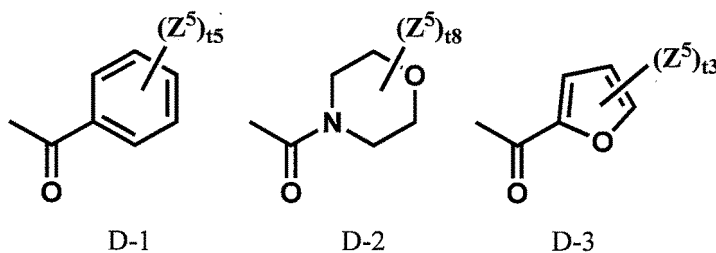
R^{15} represents a hydrogen atom or C_1 - C_6 alkyl,

Z^4 represents C_1 - C_6 alkyl,

R^1 represents a hydrogen atom, a halogen atom, halo (C_1 - C_6) alkyl, C_1 - C_6 alkyl or cyano,

R^2 represents a hydrogen atom, C_1 - C_6 alkyl, halo (C_1 - C_6) alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_6 cycloalkyl, $-C(O)R^4$, $-C(O)OR^5$, D-1, D-2 or D-3,

[Formula 7]



R^4 represents C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_6 cycloalkyl, C_1 - C_6 alkylcarbonyl, di (C_1 - C_6) alkylamino or (C_1 - C_6) alkyl substituted with R^6 ,

R^6 represents a halogen atom, C_1 - C_6 alkoxy, cyano, nitro, phenyl or phenyl substituted with R^8 ,

Z⁵ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R⁸ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R⁵ represents C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, (C₁-C₆) alkyl substituted with R⁹, phenyl or phenyl substituted with R¹⁰,

R⁹ represents a halogen atom, C₁-C₆ alkoxy, cyano, nitro, phenyl or phenyl substituted with R¹¹,

R¹⁰ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R¹¹ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R³ represents a hydrogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl or C₁-C₆ alkylcarbonyl,

X represents an oxygen atom or a sulfur atom,

Y represents an oxygen atom or a sulfur atom,

t₁ represents an integer of 0 or 1,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4,

t₅ represents an integer of 0, 1, 2, 3, 4 or 5, and

t₈ represents an integer of 0, 1, 2, 3 or 4.

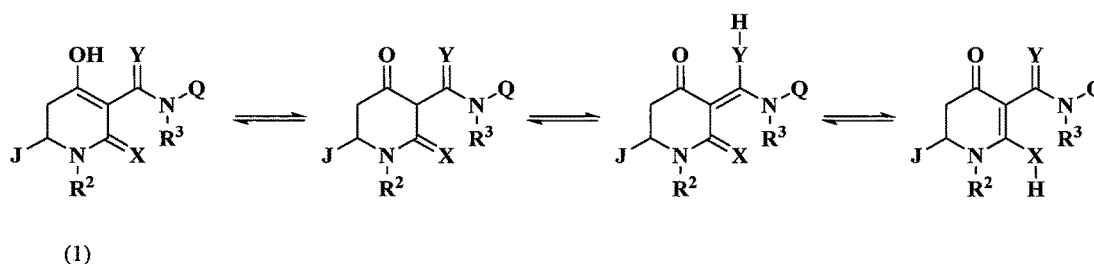
Effects of Invention

[0007] Compounds according to the present invention, which are represented by the formula (1), exert superior insecticidal and acaricidal activity against many noxious insects in agriculture, spider mites, and internal or external parasites in mammals or birds. Accordingly, the present invention can provide a novel aryltetrahydropyridine compound or a salt thereof useful as a pesticide, in particular, as an insecticide.

Description of Embodiments

[0008] For compounds according to the present invention (hereinafter, also referred to as "the presently invented compound"), which are represented by the formula (1), the existence of tautomers represented by a formula shown below are expected, and the definition of the presently invented compound represented by the formula (1) includes all of the tautomers and mixtures containing the tautomers at any ratio.

[Formula 8]



[0009] There may be geometric isomers of E-form and Z-form for the presently invented compound for some kinds of substituent, and the definition of the presently invented compound includes all of the E-form and the Z-form, and mixtures containing the E-form and the Z-form at any ratio.

[0010] There may exist optically active forms due to the presence of one or two or more asymmetric carbon atoms or asymmetric sulfur atoms for the presently invented compound, and the definition of the presently invented compound includes all of the optically active forms and racemates.

[0011] There may exist tautomers for the presently invented compound for some kinds of substituent, and the definition of the presently invented compound includes all of the tautomers and mixtures containing the tautomers at any ratio.

[0012] There may exist one or two or more rotational isomers for the presently invented compound because of limited bond rotation caused by steric hindrance between substituents, and the definition of the presently invented compound includes all of the rotational isomers and mixtures containing diastereomers at any ratio.

[0013] Salts that can be formed from the presently invented compound according to a conventional method include: salts of hydrohalic acid such as hydrofluoric acid, hydrochloric acid, hydrobromic acid, and hydroiodic acid; salts of inorganic acid such as nitric acid, sulfuric acid, phosphoric acid, chloric acid, and perchloric acid; salts of sulfonic acid such

as methanesulfonic acid, ethanesulfonic acid, trifluoromethanesulfonic acid, benzenesulfonic acid, and p-toluenesulfonic acid; salts of carboxylic acid such as formic acid, acetic acid, propionic acid, trifluoroacetic acid, fumaric acid, tartaric acid, oxalic acid, maleic acid, malic acid, succinic acid, benzoic acid, mandelic acid, ascorbic acid, lactic acid, gluconic acid, and citric acid; salts of amino acid such as glutamic acid and aspartic acid; salts of alkali metal such as lithium, sodium, and potassium; salts of alkaline earth metal such as calcium, barium, and magnesium; a salt of aluminum; and quaternary ammonium salts such as a tetramethylammonium salt, a tetrabutylammonium salt, and a benzyltrimethylammonium salt.

[0014] Next, specific examples of the substituents shown in the present specification will be shown in the following. There, n-, i-, s-, and tert- mean normal, iso, secondary, and tertiary, respectively.

[0015] Examples of "halogen atom" in the present specification include a fluorine atom, a chlorine atom, bromine atom, and an iodine atom. The term "halo" in the present specification indicates such a halogen atom.

[0016] The expression " C_a-C_b alkyl" in the present specification indicates a linear or branched hydrocarbon group having a to b carbon atoms, specific examples include methyl, ethyl, n-propyl, i-propyl, n-butyl, i-butyl, s-butyl, tert-butyl, n-pentyl, 1,1-dimethylpropyl, and n-hexyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0017] The expression "halo (C_a-C_b) alkyl" in the present specification indicates a linear or branched hydrocarbon group having a to b carbon atoms in which hydrogen atoms bonding to carbon atoms are arbitrarily substituted by a halogen atom, wherein if the alkyl group is substituted with two or more halogen atoms, the halogen atoms may be same or different from each other. Specific examples include fluoromethyl, chloromethyl, bromomethyl, iodomethyl, difluoromethyl, dichloromethyl, trifluoromethyl, chlorodifluoromethyl, trichloromethyl, bromodifluoromethyl, 1-fluoroethyl, 2-fluoroethyl, 2-chloroethyl, 2-bromoethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2-chloro-2,2-difluoroethyl, 2,2,2-trichloroethyl, 2-bromo-2,2-difluoroethyl, 1,1,2,2-tetrafluoroethyl, 2-chloro-1,1,2-trifluoroethyl, 2-chloro-1,1,2,2-tetrafluoroethyl, pentafluoroethyl, 2,2-difluoropropyl, 3,3,3-trifluoropropyl, 3-bromo-3,3-difluoropropyl, 2,2,3,3-tetrafluoropropyl, 2,2,3,3,3-pentafluoropropyl, 1,1,2,3,3,3-hexafluoropropyl, heptafluoropropyl, 2,2,2-trifluoro-1-(methyl)ethyl, 2,2,2-trifluoro-1-(trifluoromethyl)ethyl, 1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl, 2,2,3,4,4,4-hexafluorobutyl, 2,2,3,3,4,4,4-heptafluorobutyl, and nonafluorobutyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0018] The expression " C_a-C_b alkenyl" in the present specification indicates a linear or branched unsaturated hydrocarbon group having a to b carbon atoms and having one or two or more double bonds in the molecule, specific examples include vinyl, 1-propenyl, 2-propenyl, 1-methylethenyl, 2-butenyl, 2-methyl-2-propenyl, 3-methyl-2-butenyl, and 1,1-dimethyl-2-propenyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0019] The expression "halo (C_a-C_b) alkenyl" in the present specification indicates a linear or branched unsaturated hydrocarbon group having a to b carbon atoms in which hydrogen atoms bonding to carbon atoms are arbitrarily substituted by a halogen atom, and having one or two or more double bonds in the molecule; wherein if the alkenyl group is substituted with two or more halogen atoms, the halogen atoms may be same or different from each other. Specific examples include 2,2-dichlorovinyl, 2-fluoro-2-propenyl, 2-chloro-2-propenyl, 3-chloro-2-propenyl, 2-bromo-2-propenyl, 3,3-difluoro-2-propenyl, 2,3-dichloro-2-propenyl, 3,3-dichloro-2-propenyl, 2,3,3-trifluoro-2-propenyl, 2,3,3-trichloro-2-propenyl, 1-(trifluoromethyl)ethenyl, 4,4-difluoro-3-butenyl, 3,4,4-trifluoro-3-butenyl, and 3-chloro-4,4,4-trifluoro-2-butenyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0020] The expression " C_a-C_b alkynyl" in the present specification indicates a linear or branched unsaturated hydrocarbon group having a to b carbon atoms and having one or two or more triple bonds, specific examples include ethynyl, propargyl, 2-butyne, 3-butyne, 1-pentyne, and 1-hexyne, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0021] The expression "halo (C_a-C_b) alkynyl" in the present specification indicates a linear or branched unsaturated hydrocarbon group having a to b carbon atoms in which hydrogen atoms bonding to carbon atoms are arbitrarily substituted by a halogen atom, and having one or two or more triple bonds in the molecule; wherein if the alkynyl group is substituted with two or more halogen atoms, the halogen atoms may be same or different from each other. Specific examples include 2-chloroethynyl, 2-bromoethynyl, 2-iodoethynyl, 3-chloro-2-propynyl, 3-bromo-2-propynyl, and 3-iodo-2-propynyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0022] The expression " C_a-C_b alkoxy" in the present specification indicates an alkyl-O- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include methoxy, ethoxy, n-propyloxy, i-propyloxy, n-butyloxy, i-butyloxy, s-butyloxy, tert-butyloxy, and 2-ethylhexyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0023] The expression "halo (C_a-C_b) alkoxy" in the present specification indicates a haloalkyl-O- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include difluoromethoxy, trifluoromethoxy, chlorodifluoromethoxy, bromodifluoromethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2,2,2-trifluoroethoxy, 1,1,2,2,2-tetrafluoroethoxy, 2-chloro-1,1,2-trifluoroethoxy, and 1,1,2,3,3,3-hexafluoropropoxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0024] The expression " C_a-C_b alkoxy (C_d-C_e) alkoxy" in the present specification indicates an alkoxy group having d to e carbon atoms, wherein the alkoxy group has the above meaning, in which hydrogen atoms bonding to carbon atoms are

arbitrarily substituted by any C_a-C_b alkoxy group having the above meaning, specific examples include methoxymethoxy and 2-methoxyethoxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0025] The expression " C_a-C_b alkenyloxy" in the present specification indicates an alkenyl-O- group, wherein the alkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-propenyloxy, 2-butenyloxy, 2-methyl-2-propenyloxy, and 3-methyl-2-butenyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0026] The expression "halo (C_a-C_b) alkenyloxy" in the present specification indicates a haloalkenyl-O- group, wherein the haloalkenyl has a to b carbon atoms and has the above meaning, specific examples include 3,3-difluoroallyloxy and 3,3-dichloroallyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0027] The expression " C_a-C_b alkynyloxy" in the present specification indicates an alkynyl-O- group, wherein the alkynyl has a to b carbon atoms and has the above meaning, specific examples include ethynyloxy, propargyloxy, 2-butyloxy, 1-pentyloxy, and 1-hexyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0028] The expression "halo (C_a-C_b) alkynyloxy" in the present specification indicates a haloalkynyl-O- group, wherein the haloalkynyl has a to b carbon atoms and has the above meaning, specific examples include 3-chloro-2-propynyloxy, 3-bromo-2-propynyloxy, and 3-iodo-2-propynyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0029] The expression " C_a-C_b alkylthio" in the present specification indicates an alkyl-S- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include methylthio, ethylthio, n-propylthio, i-propylthio, n-butylthio, i-butylthio, s-butylthio, and tert-butylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0030] The expression "halo (C_a-C_b) alkylthio" in the present specification indicates a haloalkyl-S- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include difluoromethylthio, trifluoromethylthio, chlorodifluoromethylthio, bromodifluoromethylthio, 2,2,2-trifluoroethylthio, 1,1,2,2-tetrafluoroethylthio, 2-chloro-1,1,2-trifluoroethylthio, pentafluoroethylthio, 1,1,2,3,3,3-hexafluoropropylthio, heptafluoropropylthio, 1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethylthio, and nonafluorobutylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0031] The expression " C_a-C_b alkenylthio" in the present specification indicates an alkenyl-S- group, wherein the alkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-propenylthio, 2-butenylthio, 2-methyl-2-propenylthio, and 3-methyl-2-butenylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0032] The expression "halo (C_a-C_b) alkenylthio" in the present specification indicates a haloalkenyl-S- group, wherein the haloalkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-fluoro-2-propenylthio, 2-chloro-2-propenylthio, 3,3-difluoro-2-propenylthio, 3,3-dichloro-2-propenylthio, 2,3,3-trifluoro-2-propenylthio, 4,4-difluoro-3-butenylthio, and 3,4,4-trifluoro-3-butenylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0033] The expression " C_a-C_b alkynylthio" in the present specification indicates an alkynyl-S- group, wherein the alkynyl has a to b carbon atoms and has the above meaning, specific examples include propynylthio, butynylthio, pentynylthio, and hexynylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0034] The expression "halo (C_a-C_b) alkynylthio" in the present specification indicates a haloalkynyl-S- group, wherein the haloalkynyl has a to b carbon atoms and has the above meaning, specific examples include 3-chloro-2-propynylthio, 3-bromo-2-propynylthio, and 3-iodo-2-propynylthio, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0035] The expression " C_a-C_b alkylsulfinyl" in the present specification indicates an alkyl-S(O)- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include methylsulfinyl, ethylsulfinyl, n-propylsulfinyl, i-propylsulfinyl, n-butylsulfinyl, i-butylsulfinyl, S-butylsulfinyl, and tert-butylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0036] The expression "halo (C_a-C_b) alkylsulfinyl" in the present specification indicates a haloalkyl-S(O)- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include difluoromethylsulfinyl, trifluoromethylsulfinyl, chlorodifluoromethylsulfinyl, bromodifluoromethylsulfinyl, 2,2,2-trifluoroethylsulfinyl, 1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethylsulfinyl, and nonafluorobutylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0037] The expression " C_a-C_b alkenylsulfinyl" in the present specification indicates an alkenyl-S(O)- group, wherein the alkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-propenylsulfinyl, 2-butenylsulfinyl, 2-methyl-2-propenylsulfinyl, and 3-methyl-2-butenylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0038] The expression "halo (C_a-C_b) alkenylsulfinyl" in the present specification indicates a haloalkenyl-S(O)- group, wherein the haloalkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-fluoro-2-

propenylsulfinyl, 2-chloro-2-propenylsulfinyl, 3,3-difluoro-2-propenylsulfinyl, 3,3-dichloro-2-propenylsulfinyl, 4,4-difluoro-3-butenylsulfinyl, and 3,4,4-trifluoro-3-butenylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0039] The expression " C_a-C_b alkynylsulfinyl" in the present specification indicates an alkynyl-S(O)- group, wherein the alkynyl has a to b carbon atoms and has the above meaning, specific examples include 2-propynylsulfinyl and 2-butenylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0040] The expression "halo (C_a-C_b) alkynylsulfinyl" in the present specification indicates a haloalkynyl-S(O)- group, wherein the haloalkynyl has a to b carbon atoms and has the above meaning, specific examples include 3-chloro-2-propynylsulfinyl, 3-bromo-2-propynylsulfinyl, and 3-iodo-2-propynylsulfinyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0041] The expression " C_a-C_b alkylsulfonyl" in the present specification indicates an alkyl-SO₂- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include methylsulfonyl, ethylsulfonyl, n-propylsulfonyl, i-propylsulfonyl, n-butylsulfonyl, i-butylsulfonyl, s-butylsulfonyl, and tert-butylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0042] The expression "halo (C_a-C_b) alkylsulfonyl" in the present specification indicates a haloalkyl-SO₂- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include difluoromethylsulfonyl, trifluoromethylsulfonyl, chlorodifluoromethylsulfonyl, bromodifluoromethylsulfonyl, 2,2,2-trifluoroethylsulfonyl, 1,1,2,2-tetrafluoroethylsulfonyl, and 2-chloro-1,1,2-trifluoroethylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0043] The expression " C_a-C_b alkenylsulfonyl" in the present specification indicates an alkenyl-SO₂- group, wherein the alkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-propenylsulfonyl, 2-butenylsulfonyl, 2-methyl-2-propenylsulfonyl, and 3-methyl-2-butenylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0044] The expression "halo (C_a-C_b) alkenylsulfonyl" in the present specification indicates a haloalkenyl-SO₂- group, wherein the haloalkenyl has a to b carbon atoms and has the above meaning, specific examples include 2-fluoro-2-propenylsulfonyl, 2-chloro-2-propenylsulfonyl, 3,3-difluoro-2-propenylsulfonyl, 3,3-dichloro-2-propenylsulfonyl, 4,4-difluoro-3-butenylsulfonyl, and 3,4,4-trifluoro-3-butenylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0045] The expression " C_a-C_b alkynylsulfonyl" in the present specification indicates an alkynyl-SO₂- group, wherein the alkynyl has a to b carbon atoms and has the above meaning, specific examples include 2-propynylsulfonyl and 2-butenylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0046] The expression "halo (C_a-C_b) alkynylsulfonyl" in the present specification indicates a haloalkynyl-SO₂- group, wherein the haloalkynyl has a to b carbon atoms and has the above meaning, specific examples include 3-chloro-2-propynylsulfonyl, 3-bromo-2-propynylsulfonyl, and 3-iodo-2-propynylsulfonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0047] The expression " C_a-C_b alkylamino" in the present specification indicates an amino group in which one of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meaning, specific examples include methylamino, ethylamino, n-propylamino, i-propylamino, n-butylamino, i-butylamino, and tert-butylamino, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0048] The expression "halo (C_a-C_b) alkylamino" in the present specification indicates an amino group in which one of the hydrogen atoms is substituted by haloalkyl having a to b carbon atoms and having the above meaning, specific examples include 2,2,2-trifluoroethylamino, 2-chloro-2,2-difluoroethylamino, and 3,3,3-trifluoropropylamino, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0049] The expression "di (C_a-C_b) alkylamino" in the present specification indicates an amino group in which each of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meaning, wherein the two alkyl groups may be same or different from each other, specific examples include dimethylamino, ethyl(methyl)amino, diethylamino, n-propyl(methyl)amino, i-propyl(methyl)amino, di(n-propyl)amino, and di(n-butyl)amino, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0050] The expression "dihalo (C_a-C_b) alkylamino" in the present specification indicates an amino group in which each of the hydrogen atoms is substituted by haloalkyl having a to b carbon atoms and having the above meaning, wherein the two haloalkyl groups may be same or different from each other, specific examples include bis(2,2,2-trifluoroethyl)amino, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0051] The expression " C_a-C_b cycloalkyl" in the present specification indicates a cyclic saturated hydrocarbon group having a to b carbon atoms, and the cyclic saturated hydrocarbon group can form a three- to ten-membered single cyclic or composite cyclic structure. Each ring may be arbitrarily substituted with alkyl to accord with the specified numbers of carbon atoms. Specific examples include cyclopropyl, 1-methylcyclopropyl, 2-methylcyclopropyl, 2,2-dimethylcyclopropyl, cyclobutyl, cyclopentyl, and cyclohexyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0052] The expression " C_a-C_b alkylcarbonyl" in the present specification indicates an alkyl-C(O)- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include acetyl, propionyl, butyryl, isobutyryl, valeryl, isovaleryl, 2-methylbutanoyl, pivaloyl, hexanoyl, and heptanoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0053] The expression "halo (C_a-C_b) alkylcarbonyl" in the present specification indicates a haloalkyl-C(O)- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include fluoroacetyl, chloroacetyl, difluoroacetyl, dichloroacetyl, trifluoroacetyl, chlorodifluoroacetyl, bromodifluoroacetyl, trichloroacetyl, pentafluoropropionyl, heptafluorobutanoyl, and 3-chloro-2,2-dimethylpropanoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0054] The expression " C_a-C_b alkoxy carbonyl" in the present specification indicates an alkyl-O-C(O)- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include methoxycarbonyl, ethoxycarbonyl, n-propyloxycarbonyl, i-propyloxycarbonyl, n-butoxycarbonyl, i-butoxycarbonyl, s-butoxycarbonyl, tert-butoxycarbonyl, and 2-ethylhexyloxycarbonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0055] The expression "halo (C_a-C_b) alkoxy carbonyl" in the present specification indicates a haloalkyl-O-C(O)- group, wherein the haloalkyl has a to b carbon atoms and has the above meaning, specific examples include chloromethoxycarbonyl, 2-chloroethoxycarbonyl, 2,2-difluoroethoxycarbonyl, 2,2,2-trifluoroethoxycarbonyl, and 2,2,2-trichloroethoxycarbonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0056] The expression " C_a-C_b alkylaminocarbonyl" in the present specification indicates a carbamoyl group in which one of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meaning, specific examples include methylcarbamoyl, ethylcarbamoyl, n-propylcarbamoyl, i-propylcarbamoyl, n-butylcarbamoyl, i-butylcarbamoyl, s-butylcarbamoyl, and tert-butylcarbamoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0057] The expression "halo (C_a-C_b) alkylaminocarbonyl" in the present specification indicates a carbamoyl group in which one of the hydrogen atoms is substituted by haloalkyl having a to b carbon atoms and having the above meaning, specific examples include 2-fluoroethylcarbamoyl, 2-chloroethylcarbamoyl, 2,2-difluoroethylcarbamoyl, and 2,2,2-trifluoroethylcarbamoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0058] The expression "di (C_a-C_b) alkylaminocarbonyl" in the present specification indicates a carbamoyl group in which each of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meanings, wherein the two alkyl groups may be same or different from each other. Specific examples include N,N-dimethylcarbamoyl, N-ethyl-N-methylcarbamoyl, N,N-diethylcarbamoyl, N,N-di(n-propyl)carbamoyl, and N,N-di(n-butyl)carbamoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0059] The expression " C_a-C_b alkylcarbonyloxy" in the present specification indicates an alkyl-C(O)-O- group, wherein the alkyl has a to b carbon atoms and has the above meaning, specific examples include acetyloxy, propionyloxy, butyryloxy, and isobutyryloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0060] The expression " C_a-C_b alkoxy carbonyloxy" in the present specification indicates an alkoxy-C(O)-O- group, wherein the alkoxy has a to b carbon atoms and has the above meaning, specific examples include methoxycarbonyloxy, ethoxycarbonyloxy, i-butyloxycarbonyloxy, and tert-butyloxycarbonyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0061] The expression " C_a-C_b alkylsulfonyloxy" in the present specification indicates an alkylsulfonyl-O- group, wherein the alkylsulfonyl has a to b carbon atoms and has the above meaning, specific examples include methylsulfonyloxy, ethylsulfonyloxy, n-propylsulfonyloxy, and i-propylsulfonyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0062] The expression "halo (C_a-C_b) alkylsulfonyloxy" in the present specification indicates a haloalkylsulfonyl-O- group, wherein the haloalkylsulfonyl has a to b carbon atoms and has the above meaning, specific examples include difluoromethylsulfonyloxy, trifluoromethylsulfonyloxy, chlorodifluoromethylsulfonyloxy, and bromodifluoromethylsulfonyloxy, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0063] The expression " C_a-C_b alkylaminosulfonyl" in the present specification indicates a sulfamoyl group in which one of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meaning, specific examples include methylsulfamoyl, ethylsulfamoyl, n-propylsulfamoyl, i-propylsulfamoyl, n-butylsulfamoyl, i-butylsulfamoyl, s-butylsulfamoyl, and tert-butylsulfamoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0064] The expression "di (C_a-C_b) alkylaminosulfonyl" in the present specification indicates a sulfamoyl group in which each of the hydrogen atoms is substituted by alkyl having a to b carbon atoms and having the above meaning, wherein the two alkyl groups may be same or different from each other, specific examples include N,N-dimethylsulfamoyl, N-ethyl-N-methylsulfamoyl, N,N-diethylsulfamoyl, N,N-di(n-propyl)sulfamoyl, and N,N-di(n-butyl)sulfamoyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0065] The expression " C_a-C_b cycloalkylcarbonyl" in the present specification indicates a cycloalkyl-C(O)- group, wherein the cycloalkyl has a to b carbon atoms and has the above meaning, specific examples include cyclopropylcarbonyl, 2-methylcyclopropylcarbonyl, and cyclobutylcarbonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0066] The expression "halo (C_a-C_b) cycloalkylcarbonyl" in the present specification indicates a halocycloalkyl-C(O)- group, wherein the halocycloalkyl has a to b carbon atoms and has the above meaning, specific examples include 2,2-dichlorocyclopropylcarbonyl and 2,2-dichloro-1-methylcyclopropylcarbonyl, and appropriate one according to the specified numbers of carbon atoms is selected therefrom.

[0067] The expression " (C_a-C_b) alkyl substituted with R^6 " in the present specification indicates an alkyl group, wherein the alkyl has a to b carbon atoms and has the above meaning, in which any hydrogen atoms bonding to carbon atoms are partly or totally substituted by one or more substituents R^6 , and appropriate one according to the specified numbers of carbon atoms is selected therefrom; wherein if two or more substituents R^6 are present, the substituents R^6 may be same or different from each other.

[0068] The expression "phenyl substituted with R^8 " in the present specification indicates a phenyl group in which any hydrogen atoms bonding to carbon atoms are substituted by one or more substituents R^8 ; wherein if two or more substituents R^8 are present, the substituents R^8 may be same or different from each other.

[0069] The expression " (C_a-C_b) alkyl substituted with R^9 " in the present specification indicates an alkyl group, wherein the alkyl has a to b carbon atoms and has the above meaning, in which any hydrogen atoms bonding to carbon atoms are partly or totally substituted by one or more substituents R^9 , and appropriate one according to the specified numbers of carbon atoms is selected therefrom; wherein if two or more substituents R^9 are present, the substituents R^9 may be same or different from each other.

[0070] The expression "phenyl substituted with R^{10} " in the present specification indicates a phenyl group in which any hydrogen atoms bonding to carbon atoms are substituted by one or more substituents R^{10} ; wherein if two or more substituents R^{10} are present, the substituents R^{10} may be same or different from each other.

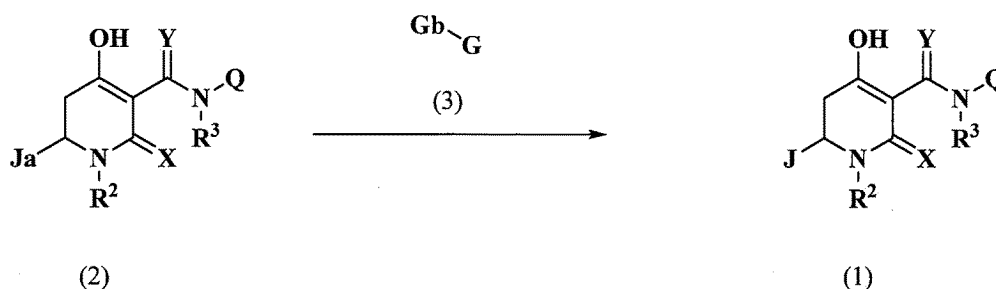
[0071] The expression "phenyl substituted with R^{11} " in the present specification indicates a phenyl group in which any hydrogen atoms bonding to carbon atoms are substituted by one or more substituents R^{11} ; wherein if two or more substituents R^{11} are present, the substituents R^{11} may be same or different from each other.

[0072] Next, production methods for the presently invented compound represented by the formula (1) will be described in the following. For example, the presently invented compound can be produced with any of methods shown below. Description given below merely shows examples, and the presently invented compound represented by the formula (1) may be produced with another method. Hereinafter, "the presently invented compound represented by the formula (1)" is also referred to as "presently invented compound (1)", and "a (the) compound represented by a formula (2)" is also referred to as "compound (2)". Other compounds are described in the same manner as this.

[Production Method 1]

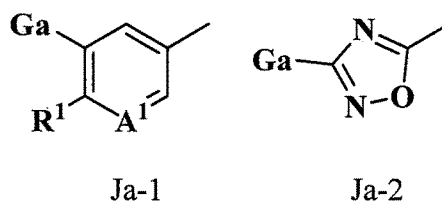
[0073] Presently invented compound (1) can be produced by reacting compound (2) and compound (3):

[Formula 9]



wherein Ja represents Ja-1 or Ja-2,

[Formula 10]



J, Q, G, X, Y, A¹, R¹, R², and R³ have the same meaning as described above, Ga represents, for example, a halogen atom, and Gb represents, for example, B(OH)₂.

[0074] Presently invented compound (1) can be produced by reacting compound (2) and compound (3) in a solvent or without any solvent.

[0075] If a solvent is used, the solvent to be used needs to be inert to the reaction, and examples thereof include: water; alcoholic solvents such as methanol and ethanol; ether solvents such as diethyl ether, tetrahydrofuran, 1,4-dioxane, and 1,2-dimethoxyethane; aromatic hydrocarbon solvents such as benzene, xylene, and toluene; aliphatic hydrocarbon solvents such as pentane, hexane, and cyclohexane; halogenated hydrocarbon solvents such as dichloromethane, chloroform, and 1,2-dichloroethane; nitrile solvents such as acetonitrile and propionitrile; amide solvents such as N,N-dimethylformamide, N,N-dimethylacetamide, N-methylpyrrolidone, and N,N'-dimethylimidazolidinone; dimethyl sulfoxide; and mixed solvents of any of them.

[0076] The reaction may be performed with a base. Examples of the applicable base include: organic bases such as pyridine, 2,6-lutidine, 4-dimethylaminopyridine, triethylamine, diisopropylethylamine, tributylamine, N,N-dimethylaniline, 1,4-diazabicyclo[2.2.2]octane (DABCO), 1,8-diazabicyclo[5.4.0]-7-undecene (DBU), and 1,5-diazabicyclo[4.3.0]-5-nonene (DBN); inorganic bases such as sodium hydroxide, potassium hydroxide, sodium hydride, sodium hydrogen carbonate, potassium carbonate, cesium carbonate, and potassium phosphate; and metal alkoxides such as sodium methoxide, sodium ethoxide, and potassium tert-butoxide. The amount of usage (equivalent) of the base can be 0.1 to 100 equivalents per equivalent of compound (2).

[0077] The reaction can be performed in the presence of a palladium catalyst. Examples of the palladium catalyst include a [1,1'-bis(diphenylphosphino)ferrocene]palladium (divalent) dichloride dichloromethane adduct. The amount of usage of the palladium catalyst can be 0.005 to 20 equivalents per equivalent of compound (2).

[0078] The reaction can be performed in the presence of a ligand. Examples of the ligand include 1,1'-bis(diphenylphosphino)ferrocene. The amount of usage of the ligand can be 0.005 to 20 equivalents per equivalent of compound (2).

[0079] The reaction temperature can be set to any temperature between -78°C and the reflux temperature of the reaction mixture, and the reaction time, which depends on the concentrations of the reaction substrates and the reaction temperature, can be arbitrarily set typically in the range of 5 minutes to 100 hours.

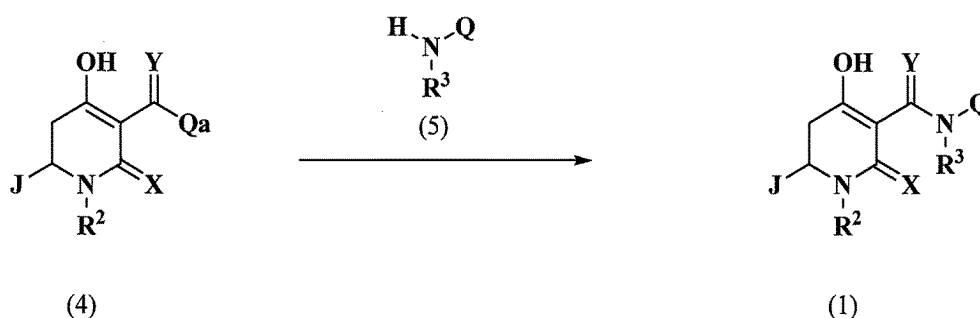
[0080] Compound (2) can be produced by using a method known to the public through publication, for example, according to a method described in International Publication No. WO 2021/261562.

[0081] Some kinds of compound (3) are known compounds, and some of them are obtainable as commercially available products. Even compounds other than them can be produced according to synthesis methods for the known compounds.

[Production Method 2]

[0082] Presently invented compound (1) can be produced by reacting compound (4) and compound (5):

[Formula 11]



wherein J, Q, X, Y, R², and R³ have the same meaning as described above, and Qa represents C₁-C₆ alkoxy.

[0083] Presently invented compound (1) can be produced by reacting compound (4) and compound (5) in a solvent or without any solvent.

[0084] If a solvent is used, the solvent to be used needs to be inert to the reaction, and examples thereof include the solvents shown as examples in Production Method 1.

[0085] The reaction may be performed with a base. Examples of the applicable base include the bases shown as examples in Production Method 1. The amount of usage (equivalent) of the base can be 0.1 to 100 equivalents per equivalent of compound (4).

[0086] The reaction temperature can be set to any temperature between -78°C and the reflux temperature of the reaction mixture, and the reaction time, which depends on the concentrations of the reaction substrates and the reaction temperature, can be arbitrarily set typically in the range of 5 minutes to 100 hours.

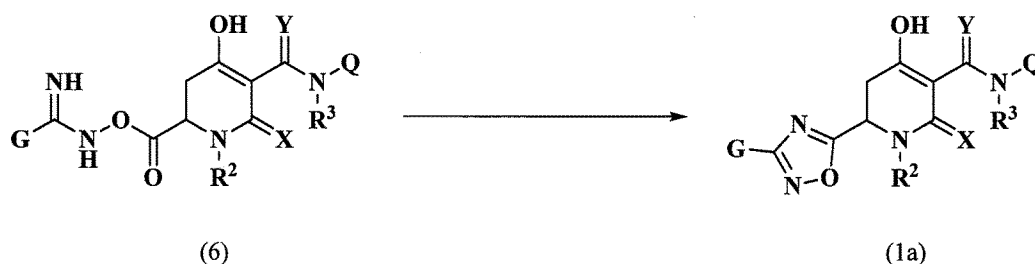
[0087] Compound (4) can be produced by using a method known to the public through publication, for example, according to a method described in International Publication No. WO 2021/261562.

[0088] Some kinds of compound (5) are known compounds, and some of them are obtainable as commercially available products. Even compounds other than them can be produced according to synthesis methods for the known compounds.

[Production Method 3]

[0089] Compound (1a), which is presently invented compound (1) in which J represents J-2, can be produced by reacting compound (6):

[Formula 12]



wherein, Q, G, X, Y, R², and R³ have the same meanings as described above.

[0090] Compound (1a) can be produced by reacting compound (6) in a solvent or without any solvent.

[0091] If a solvent is used, the solvent to be used needs to be inert to the reaction, and examples thereof include the solvents shown as examples in Production Method 1.

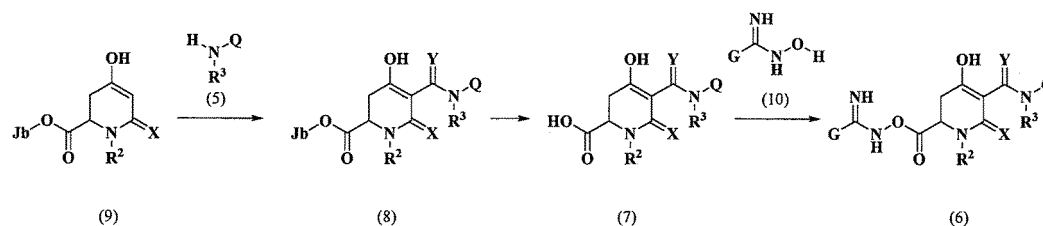
[0092] The reaction may be performed with a base. Examples of the applicable base include the bases shown as examples in Production Method 1. The amount of usage (equivalent) of the base can be 0.1 to 100 equivalents per equivalent of compound (6).

[0093] The reaction temperature can be set to any temperature between -78°C and the reflux temperature of the reaction mixture, and the reaction time, which depends on the concentrations of the reaction substrates and the reaction temperature, can be arbitrarily set typically in the range of 5 minutes to 100 hours.

[0094] Compound (6) to be used in Production Method 3 can be produced according to the following reaction formula:

[Reaction Formula 1]

[Formula 13]



wherein Q, G, X, Y, R², and R³ have the same meanings as described above, and Jb represents C₁-C₆ alkyl.

[Production Step 1]

[0095] Compound (8) can be produced by reacting compound (9) with compound (5) by using a method known to the public through publication, for example, according to a method described in International Publication No. WO 2016/118611.

[0096] Some kinds of compound (9) are known compounds, and some of them are obtainable as commercially available products. Even compounds other than them can be produced by using a method known to the public through publication, for example, according to a method described in The Journal of Organic Chemistry, 2004, vol. 69, pp. 130 to 141.

[Production Step 2]

[0097] Compound (7) can be produced by reacting compound (8) by using a method known to the public through publication, for example, according to a method described in The Journal of Organic Chemistry, 2006, vol. 24, pp. 9045 to 9050.

[Production Step 3]

[0098] Compound (6) can be produced by reacting compound (7) with compound (10) by using a method known to the public through publication, for example, according to a method described in Synthetic Communications, 2006, vol. 36, pp. 729 to 741.

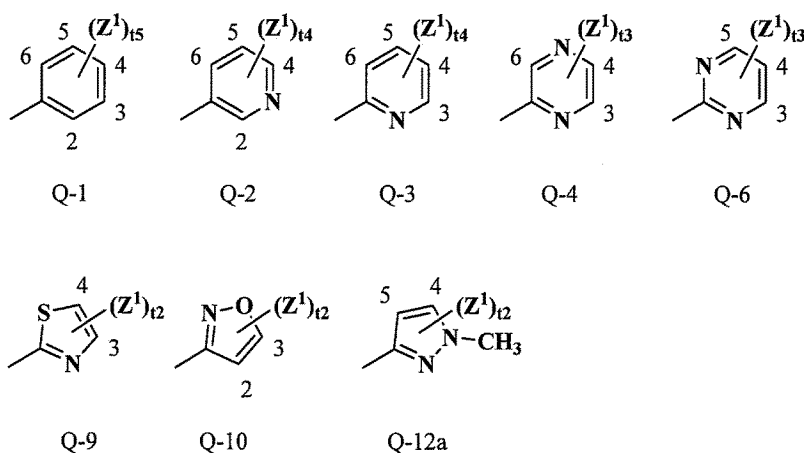
[0099] Some kinds of compound (10) are known compounds, and some of them are obtainable as commercially available products. Even compounds other than them can be produced according to a method described in Bioorganic & Medicinal Chemistry, 2018, vol. 26, pp. 1713 to 1726.

[0100] In each of the reactions of Production Methods 1 to 3 and Reaction Formula 1, the reaction mixture after the completion of the reaction can be subjected to conventional aftertreatment such as direct concentration, or dissolution in organic solvent, washing with water, and then concentration, or putting in iced water, extraction with organic solvent, and then concentration, giving the target presently invented compound. If the need of purification arises, separation and purification can be performed with any purification method such as recrystallization, a column chromatograph, a thin-layer chromatograph, and separation with a liquid chromatograph.

[0101] Examples of production intermediates for the presently invented compound that can be produced with any of those methods include compounds shown in Table 1 to Table 6.

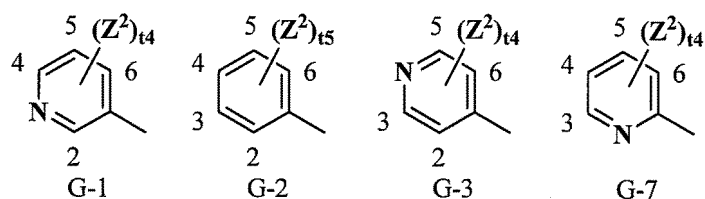
[0102] In the tables, the notations Q-1, Q-2, Q-3, Q-4, Q-6, Q-9, Q-10, and Q-12a indicate the following structures.

[Formula 14]



[0103] In the tables, the notations G-1, G-2, G-3, and G-7 indicate the following structures.

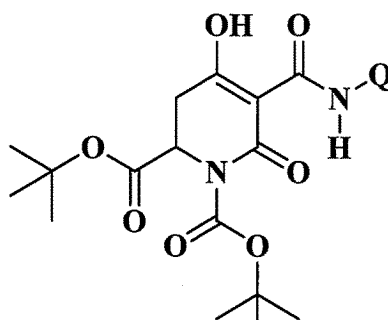
[Formula 15]



[0104] The numbers given to the structural formulas are each a number indicating the position of substitution with the substituent $(Z^1)_{t2}$, $(Z^1)_{t3}$, $(Z^1)_{t4}$, $(Z^1)_{t5}$, $(Z^2)_{t4}$ or $(Z^2)_{t5}$; for example, "Q-1(4-F)" in the tables means "4-fluorophenyl", wherein "Q-1" means "phenyl".

[Table 1]

[Formula 16]

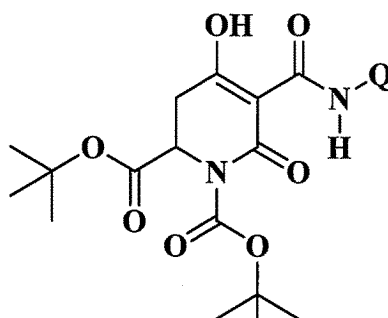


Q

Q-1
 Q-1(4-F)
 Q-1(4-Cl)
 Q-1(4-Br)
 Q-1(4-I)
 Q-1(4-CN)
 Q-1(4-CH₃)
 Q-1(4-CF₃)
 Q-2
 Q-2(4-F)
 Q-2(4-Cl)
 Q-2(4-Br)
 Q-2(4-I)
 Q-2(4-CN)
 Q-2(4-CH₃)
 Q-2(4-CF₃)
 Q-3
 Q-3(4-F)
 Q-3(4-Cl)
 Q-3(4-Br)
 Q-3(4-I)
 Q-3(4-CN)
 Q-3(4-CH₃)
 Q-3(4-CF₃)
 Q-4
 Q-4(4-F)

(continued)

[Formula 16]



Q

Q-4(4-Cl)

Q-4(4-Br)

Q-4(4-I)

Q-4(4-CN)

Q-4(4-CH₃)Q-4(4-CF₃)

Q-6

Q-6(4-F)

Q-6(4-Cl)

Q-6(4-Br)

Q-6(4-I)

Q-6(4-CN)

Q-6(4-CH₃)Q-6(4-CF₃)

Q-9

Q-9(4-F)

Q-9(4-Cl)

Q-9(4-Br)

Q-9(4-I)

Q-9(4-CN)

Q-9(4-CH₃)Q-9(4-CF₃)

Q-10

Q-10(3-F)

Q-10(3-Cl)

Q-10(3-Br)

Q-10(3-I)

Q-10(3-CN)

Q-10(3-CH₃)Q-10(3-CF₃)

Q-12a

Q-12a(4-F)

Q-12a(4-Cl)

Q-12a(4-Br)

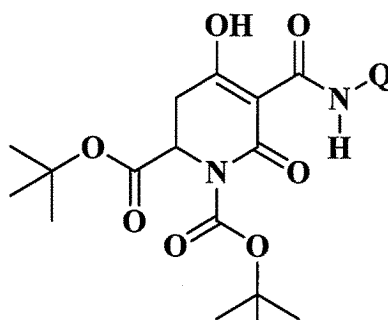
Q-12a(4-I)

Q-12a(4-CN)

Q-12a(4-CH₃)Q-12a(4-CF₃)

(continued)

[Formula 16]

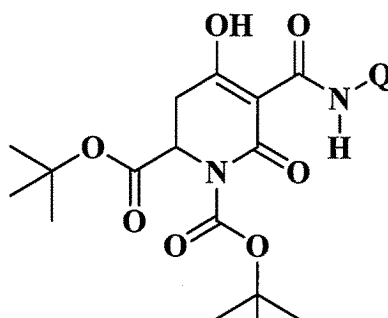


Q

Q-1(3-F)
Q-1(3-Cl)
Q-1(3-Br)
Q-1(3-I)
Q-1(3-CN)
Q-1(3-CH₃)
Q-1(3-CF₃)
Q-1(2-F)
Q-1(2-Cl)
Q-1(2-Br)
Q-1(2-I)
Q-1(2-CN)
Q-1(2-CH₃)
Q-1(2-CF₃)
Q-3(3-F)
Q-3(3-Cl)
Q-3(3-Br)
Q-3(3-I)
Q-3(3-CN)
Q-3(3-CH₃)
Q-3(3-CF₃)
Q-3(5-F)
Q-3(5-Cl)
Q-3(5-Br)
Q-3(5-I)
Q-3(5-CN)
Q-3(5-CH₃)
Q-3(5-CF₃)
Q-3(6-F)
Q-3(6-Cl)
Q-3(6-Br)
Q-3(6-I)
Q-3(6-CN)
Q-3(6-CH₃)
Q-3(6-CF₃)
Q-4(3-F)
Q-4(3-Cl)
Q-4(3-Br)

(continued)

[Formula 16]

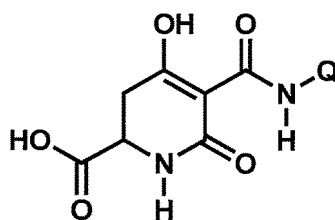


Q

Q-4(3-I)
Q-4(3-CN)
Q-4(3-CH₃)
Q-4(3-CF₃)
Q-6(3-F)
Q-6(3-Cl)
Q-6(3-Br)
Q-6(3-I)
Q-6(3-CN)
Q-6(3-CH₃)
Q-6(3-CF₃)
Q-9(3-F)
Q-9(3-Cl)
Q-9(3-Br)
Q-9(3-I)
Q-9(3-CN)
Q-9(3-CH₃)
Q-9(3-CF₃)

[Table 2]

[Formula 17]

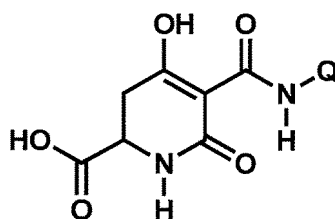


Q

Q-1
Q-1(4-F)
Q-1(4-Cl)
Q-1(4-Br)
Q-1(4-I)
Q-1(4-CN)
Q-1(4-CH₃)

(continued)

[Formula 17]



Q

Q-1(4-CF₃)

Q-2

Q-2(4-F)

Q-2(4-Cl)

Q-2(4-Br)

Q-2(4-I)

Q-2(4-CN)

Q-2(4-CH₃)Q-2(4-CF₃)

Q-3

Q-3(4-F)

Q-3(4-Cl)

Q-3(4-Br)

Q-3(4-I)

Q-3(4-CN)

Q-3(4-CH₃)Q-3(4-CF₃)

Q-4

Q-4(4-F)

Q-4(4-Cl)

Q-4(4-Br)

Q-4(4-I)

Q-4(4-CN)

Q-4(4-CH₃)Q-4(4-CF₃)

Q-6

Q-6(4-F)

Q-6(4-Cl)

Q-6(4-Br)

Q-6(4-I)

Q-6(4-CN)

Q-6(4-CH₃)Q-6(4-CF₃)

Q-9

Q-9(4-F)

Q-9(4-Cl)

Q-9(4-Br)

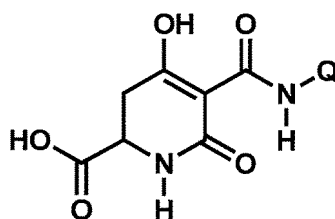
Q-9(4-I)

Q-9(4-CN)

Q-9(4-CH₃)Q-9(4-CF₃)

(continued)

[Formula 17]



Q

Q-10

Q-10(3-F)

Q-10(3-Cl)

Q-10(3-Br)

Q-10(3-I)

Q-10(3-CN)

Q-10(3-CH₃)Q-10(3-CF₃)

Q-12a

Q-12a(4-F)

Q-12a(4-Cl)

Q-12a(4-Br)

Q-12a(4-I)

Q-12a(4-CN)

Q-12a(4-CH₃)Q-12a(4-CF₃)

Q-1(3-F)

Q-1(3-Cl)

Q-1(3-Br)

Q-1(3-I)

Q-1(3-CN)

Q-1(3-CH₃)Q-1(3-CF₃)

Q-1(2-F)

Q-1(2-Cl)

Q-1(2-Br)

Q-1(2-I)

Q-1(2-CN)

Q-1(2-CH₃)Q-1(2-CF₃)

Q-3(3-F)

Q-3(3-Cl)

Q-3(3-Br)

Q-3(3-I)

Q-3(3-CN)

Q-3(3-CH₃)Q-3(3-CF₃)

Q-3(5-F)

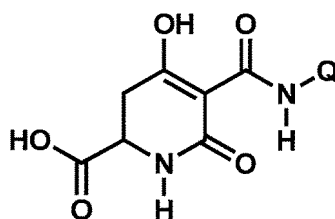
Q-3(5-Cl)

Q-3(5-Br)

Q-3(5-I)

(continued)

[Formula 17]



Q

Q-3(5-CN)

Q-3(5-CH₃)Q-3(5-CF₃)

Q-3(6-F)

Q-3(6-Cl)

Q-3(6-Br)

Q-3(6-I)

Q-3(6-CN)

Q-3(6-CH₃)Q-3(6-CF₃)

Q-4(3-F)

Q-4(3-Cl)

Q-4(3-Br)

Q-4(3-I)

Q-4(3-CN)

Q-4(3-CH₃)Q-4(3-CF₃)

Q-6(3-F)

Q-6(3-Cl)

Q-6(3-Br)

Q-6(3-I)

Q-6(3-CN)

Q-6(3-CH₃)Q-6(3-CF₃)

Q-9(3-F)

Q-9(3-Cl)

Q-9(3-Br)

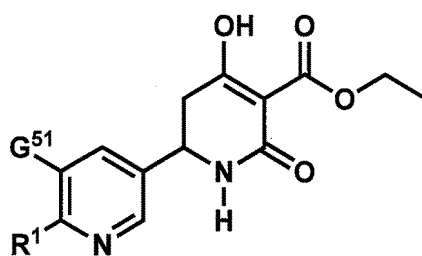
Q-9(3-I)

Q-9(3-CN)

Q-9(3-CH₃)Q-9(3-CF₃)

[Table 3]

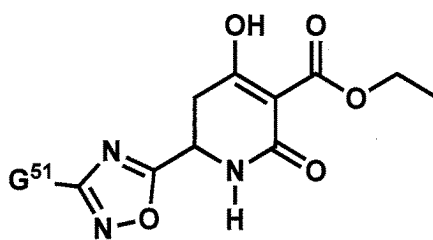
[Formula 18]



R¹	G⁵¹
H	Cl
H	Br
H	I
F	Cl
F	Br
F	I
Cl	Cl
Cl	Br
Cl	I
CHF₂	Cl
CHF₂	Br
CHF₂	I
CF₃	Cl
CF₃	Br
CF₃	I

[Table 4]

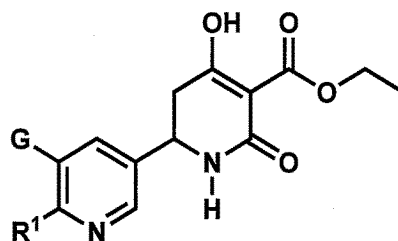
[Formula 19]



G⁵¹
Cl
Br
I

[Table 5]

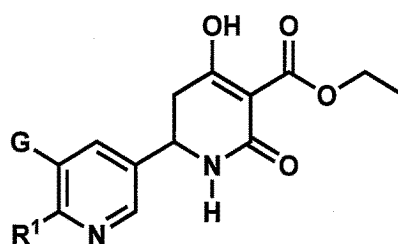
[Formula 20]



R ¹	G
Cl	G-7
Cl	G-1
Cl	G-3
Cl	G-2
Cl	G-7(3-F)
Cl	G-7(4-F)
Cl	G-7(5-F)
Cl	G-7(6-F)
Cl	G-1(2-F)
Cl	G-1(4-F)
Cl	G-1(5-F)
Cl	G-1(6-F)
Cl	G-3(2-F)
Cl	G-3(3-F)
Cl	G-2(2-F)
Cl	G-2(3-F)
Cl	G-2(4-F)
Cl	G-2(2-F,4-F)
Cl	G-2(2-F,5-F)
Cl	G-7(3-Cl)
Cl	G-7(4-Cl)
Cl	G-7(5-Cl)
Cl	G-7(6-Cl)
Cl	G-1(2-Cl)
Cl	G-1(4-Cl)
Cl	G-1(5-Cl)
Cl	G-1(6-Cl)
Cl	G-3(2-Cl)
Cl	G-3(3-Cl)
Cl	G-2(2-Cl)
Cl	G-2(3-Cl)
Cl	G-2(4-Cl)
Cl	G-2(2-Cl,4-Cl)
Cl	G-2(2-Cl,5-Cl)
Cl	G-7(3-CH ₃)
Cl	G-7(4-CH ₃)
Cl	G-7(5-CH ₃)
Cl	G-7(6-CH ₃)
Cl	G-1(2-CH ₃)

(continued)

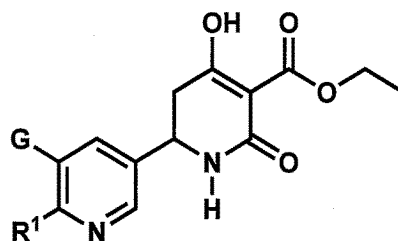
[Formula 20]



R ¹	G
Cl	G-1(4-CH ₃)
Cl	G-1(5-CH ₃)
Cl	G-1(6-CH ₃)
Cl	G-3(2-CH ₃)
Cl	G-3(3-CH ₃)
Cl	G-2(2-CH ₃)
Cl	G-2(3-CH ₃)
Cl	G-2(4-CH ₃)
Cl	G-2(2-CH ₃ , 4-CH ₃)
Cl	G-2(2-CH ₃ , 5-CH ₃)
Cl	G-7(3-CF ₃)
Cl	G-7(4-CF ₃)
Cl	G-7(5-CF ₃)
Cl	G-7(6-CF ₃)
Cl	G-1(2-CF ₃)
Cl	G-1(4-CF ₃)
Cl	G-1(5-CF ₃)
Cl	G-1(6-CF ₃)
Cl	G-3(2-CF ₃)
Cl	G-3(3-CF ₃)
Cl	G-2(2-CF ₃)
Cl	G-2(3-CF ₃)
Cl	G-2(4-CF ₃)
Cl	G-2(2-CF ₃ , 4-CF ₃)
Cl	G-2(2-CF ₃ , 5-CF ₃)
CF ₃	G-7
CF ₃	G-1
CF ₃	G-3
CF ₃	G-2
CF ₃	G-7(3-F)
CF ₃	G-7(4-F)
CF ₃	G-7(5-F)
CF ₃	G-7(6-F)
CF ₃	G-1(2-F)
CF ₃	G-1(4-F)
CF ₃	G-1(5-F)
CF ₃	G-1(6-F)
CF ₃	G-3(2-F)
CF ₃	G-3(3-F)

(continued)

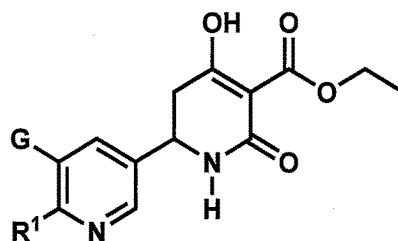
[Formula 20]



R ¹	G
CF ₃	G-2(2-F)
CF ₃	G-2(3-F)
CF ₃	G-2(4-F)
CF ₃	G-2(2-F,4-F)
CF ₃	G-2(2-F,5-F)
CF ₃	G-7(3-Cl)
CF ₃	G-7(4-Cl)
CF ₃	G-7(5-Cl)
CF ₃	G-7(6-Cl)
CF ₃	G-1(2-Cl)
CF ₃	G-1(4-Cl)
CF ₃	G-1(5-Cl)
CF ₃	G-1(6-Cl)
CF ₃	G-3(2-Cl)
CF ₃	G-3(3-Cl)
CF ₃	G-2(2-Cl)
CF ₃	G-2(3-Cl)
CF ₃	G-2(4-Cl)
CF ₃	G-2(2-Cl,4-Cl)
CF ₃	G-2(2-Cl,5-Cl)
CF ₃	G-7(3-CH ₃)
CF ₃	G-7(4-CH ₃)
CF ₃	G-7(5-CH ₃)
CF ₃	G-7(6-CH ₃)
CF ₃	G-1(2-CH ₃)
CF ₃	G-1(4-CH ₃)
CF ₃	G-1(5-CH ₃)
CF ₃	G-1(6-CH ₃)
CF ₃	G-3(2-CH ₃)
CF ₃	G-3(3-CH ₃)
CF ₃	G-2(2-CH ₃)
CF ₃	G-2(3-CH ₃)
CF ₃	G-2(4-CH ₃)
CF ₃	G-2(2-CH ₃ ,4-CH ₃)
CF ₃	G-2(2-CH ₃ ,5-CH ₃)
CF ₃	G-7(3-CF ₃)
CF ₃	G-7(4-CF ₃)
CF ₃	G-7(5-CF ₃)
CF ₃	G-7(6-CF ₃)

(continued)

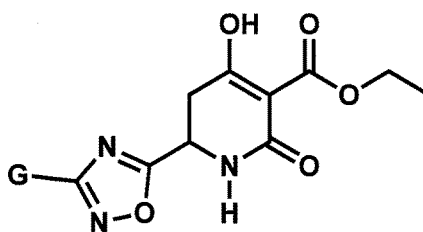
[Formula 20]



R ¹	G
CF ₃	G-1(2-CF ₃)
CF ₃	G-1(4-CF ₃)
CF ₃	G-1(5-CF ₃)
CF ₃	G-1(6-CF ₃)
CF ₃	G-3(2-CF ₃)
CF ₃	G-3(3-CF ₃)
CF ₃	G-2(2-CF ₃)
CF ₃	G-2(3-CF ₃)
CF ₃	G-2(4-CF ₃)
CF ₃	G-2(2-CF ₃ ,4-CF ₃)
CF ₃	G-2(2-CF ₃ ,5-CF ₃)

[Table 6]

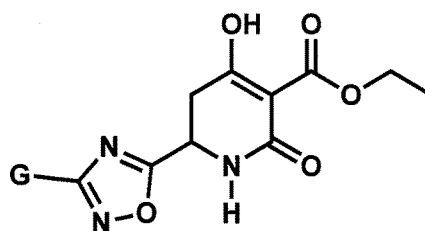
[Formula 21]



G
G-7
G-1
G-3
G-2
G-7(3-F)
G-7(4-F)
G-7(5-F)
G-7(6-F)
G-1(2-F)
G-1(4-F)
G-1(5-F)
G-1(6-F)
G-3(2-F)
G-3(3-F)
G-2(2-F)

(continued)

[Formula 21]



G

G-2(3-F)

G-2(4-F)

G-2(2-F,4-F)

G-2(2-F,5-F)

G-7(3-Cl)

G-7(4-Cl)

G-7(5-Cl)

G-7(6-Cl)

G-1(2-Cl)

G-1(4-Cl)

G-1(5-Cl)

G-1(6-Cl)

G-3(2-Cl)

G-3(3-Cl)

G-2(2-Cl)

G-2(3-Cl)

G-2(4-Cl)

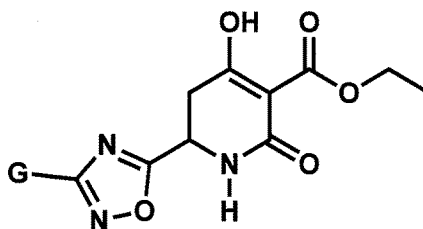
G-2(2-Cl,4-Cl)

G-2(2-Cl,5-Cl)

G-7(3-CH₃)G-7(4-CH₃)G-7(5-CH₃)G-7(6-CH₃)G-1(2-CH₃)G-1(4-CH₃)G-1(5-CH₃)G-1(6-CH₃)G-3(2-CH₃)G-3(3-CH₃)G-2(2-CH₃)G-2(3-CH₃)G-2(4-CH₃)G-2(2-CH₃,4-CH₃)G-2(2-CH₃,5-CH₃)G-7(3-CF₃)G-7(4-CF₃)G-7(5-CF₃)G-7(6-CF₃)G-1(2-CF₃)G-1(4-CF₃)G-1(5-CF₃)

(continued)

[Formula 21]



G

G-1(6-CF₃)G-3(2-CF₃)G-3(3-CF₃)G-2(2-CF₃)G-2(3-CF₃)G-2(4-CF₃)G-2(2-CF₃,4-CF₃)G-2(2-CF₃,5-CF₃)

[0105] The term pesticides in the present invention means noxious insect control agents against harmful arthropods, for example, in the field of agriculture and horticulture or in the field of livestock industry and/or hygiene (internal parasites and external parasites in mammals or birds as livestock or pets, and sanitary insects and nuisance insects at home and in industry).

[0106] The term agrochemicals in the present invention means, for example, insecticides or acaricides, nematocides, herbicides, and microbicides in the field of agriculture and horticulture.

[0107] The term sanitary insects herein means, for example, harmful invertebrates that give rise to severe pain or allergic symptoms such as puffiness and itching and cause lethal anaphylactic shock in some cases by stinging a target animal, and occasionally spread serious diseases to bring about death in some cases through blood-sucking, invertebrates that come in contact with foods and thereby contaminate the foods with pathogens such as viruses, bacteria, and parasites in some cases, invertebrates that cause allergic diseases such as bronchial asthma, rhinitis, conjunctivitis, and atopic dermatitis via their living bodies, dead bodies, exuviae, feces, etc., as allergens, invertebrates that cause economic damage by damaging foods, cloths, housing, etc., through eating, and invertebrates that do not cause direct damage but give rise to unpleasant feelings through generation in and/or invasion into human residential environments. More specifically, the term means ants, which bite with their mandibles, wasps, which sting with their stings, mosquitoes and assassin bugs, which suck blood from skin, and termites, which are omnivorous and cause damage to buildings such as houses.

[0108] The term nuisance insects herein refers to noxious insects that do not directly harm humans in human living environments but give rise to unpleasant feelings to cause mental damage through their appearances and shapes.

[0109] Specific examples of insects, mites, crustaceans, mollusks, nematodes, external parasites, and internal parasites that can be controlled with the presently invented compound include the following organisms, but not limited to them in the present invention.

[0110] Examples of noxious insects include:

Lepidoptera; allium leafminer (*Acrolepiopsis sapporensis*), yam leafminer (*Acrolepiopsis suzukiella*), smaller tea tortrix (*Adoxophyes honmai*), summer fruit tortrix (*Adoxophyes orana fasciata*), fruit-piercing moth (*Adris tyrannus*), sweet potato leaf worm (*Aedia leucomelas*), black cutworm (*Agrotis ipsilon*), turnip moth (*Agrotis segetum*), cotton leafworm (*Alabama argillacea*), Asiatic leafroller (*Archips breviplicatus*), apple tortrix (*Archips fuscocupreanus*), oriental tussock moth (*Artaxa subflava*), bamboo zygænid (*Artona martini*), Japanese giant looper (*Ascotis selenaria*), Asiatic common looper (*Autographa nigrisigna*), pear leaf miner (*Bucculatrix pyrivorella*), tea leafroller (*Caloptilia theivora*), peach fruit moth (*Carpocapsa sasakii*), rice stem borer (*Chilo suppressalis*), rice leafroller (*Cnaphalocrocis medinalis*), yellow peach moth (*Conogethes punctiferalis*), carpenter moth (*Cossus insularis*), three-spotted plusia (*Ctenoplia agnata*), codling moth (*Cydia pomonella*), pine moth (*Dendrolimus spectabilis*), Japanese hemlock caterpillar (*Dendrolimus superans*), cucumber moth (*Diaphania indica*), sugarcane borer (*Diatraea saccharalis*), *Eilema fuscodorsalis* (*Eilema fuscodorsalis*), *Eilema laevis* (*Eilema laevis*), lesser corn stalk borer (*Elasmopalpus*

lignosellus), grape berry moth (*Endopiza viteana*), limabean pod borer (*Etiella zinckenella*), *Euproctis piperita*, tea tussock moth (*Euproctis pseudoconspersa*), Japanese bamboo lappet moth (*Euthrix albomaculata*), drinker moth (*Euthrix potatoria*), oriental lappet (*Gastropacha orientalis*), mulberry pyralid (*Glyphodes pyloalis*), plum fruit moth (*Grapholita dimorpha*), oriental fruit moth (*Grapholita molesta*), sweetpotato leafhopper (*Helcystogramma triannulata*), cotton bollworm (*Helicoverpa armigera*), oriental tobacco budworm (*Helicoverpa assulta*), corn earworm (*Helicoverpa zea*), tobacco budworm (*Heliothis virescens*), cabbage webworm (*Hellula undalis*), oriental tea tortrix (*Homona magnanima*), fall webworm moth (*Hyphantria cunea*), pearleaf worm (*Illiberis pruni*), prunus bud moth (*Illiberis rotundata*), *Quercus lasiocampid* (*Kunugia undans*), *Quercus lasiocampid* (*Kunugia yamadai*), soybean pod borer (*Leguminivora glycinivorella*), mulberry tiger moth (*Lemyra imparilis*), gypsy moth (*Lymantria dispar*), peach leafminer (*Lyonetia clerkella*), *Lyonetia prunifoliella* malinella, cabbage armyworm (*Mamestra brassicae*), tomato hornworm (*Manduca quinquemaculata*), tobacco hornworm (*Manduca sexta*), soybean podworm (*Matsumuraeses phaseoli*), oriental moth (*Monema flavescens*), rice green caterpillar (*Naranga aeneascens*), white-spotted tussock moth (*Orgyia thyellina*), Asian corn borer (*Ostrinia furnacalis*), European corn borer (*Ostrinia nubilalis*), adzuki bean borer (*Ostrinia scapulalis*), dark fruit-tree tortrix (*Pandemis heparana*), bluegrass webworm (*Parapediasia teterella*), green cochlid (*Parasa consocia*), *Parasa lepida*, Chinese cochlid (*Parasa sinica*), straight swift (*Parnara guttata*), pink bollworm (*Pectinophora gossypiella*), citrus leafminer (*Phyllocnistis citrella*), apple leafminer (*Phyllonorycter ringoniella*), large white (*Pieris brassicae*), cabbage white butterfly (*Pieris rapae crucivora*), diamondback moth (*Plutella xylostella*), oriental armyworm (*Pseudaletia separata*), soybean looper (*Pseudoplusia includens*), swan moth (*Sphrageidus similis*), lawn grass cutworm (*Spodoptera depravata*), southern armyworm (*Spodoptera eridania*), beet armyworm (*Spodoptera exigua*), fall armyworm (*Spodoptera frugiperda*), cotton leafworm (*Spodoptera littoralis*), common cutworm (*Spodoptera litura*), persimmon fruit moth (*Stathmopoda masinissa*), peach tree borer (*Synanthedon exitiosa*), cherry tree borer (*Synanthedon Hector*), *Toleria romanovi*, and cabbage looper (*Trichoplusia ni*), Coleoptera; common bean weevil (*Acanthoscelides obtectus*), cupreous chafer (*Anomala cuprea*), soybean beetle (*Anomala rufocuprea*), Asian long-horn beetle (*Anoplophora glabripennis*), white-spotted longicorn beetle (*Anoplophora malasiaca*), boll weevil (*Anthonomus grandis*), cucurbit leaf beetle (*Aulacophora femoralis*), adzuki bean beetle (*Callosobruchus chinensis*), beet flea beetle (*Chaetocnema concinna*), sweetpotato weevil (*Cylas formicarius*), leaf beetle (*Demotina fasciculata*), northern corn rootworm (*Diabrotica barberi*), southern corn rootworm (*Diabrotica undecimpunctata*), western corn rootworm (*Diabrotica virgifera*), rice plant weevil (*Echinocnemus squameus*), Mexican bean beetle (*Epilachna varivestis*), large twenty-eight-spotted ladybird (*Epilachna vigintioctomaculata*), twenty-eight-spotted ladybird (*Epilachna vigintioctopunctata*), *Epuraea domina*, West Indian sweet potato weevil (*Euscepes postfasciatus*), citrus flower chafer (*Gametis jucunda*), white-fringed beetle (*Graphognathus leucoloma*), yellowish elongate chafer (*Heptophylla picea*), alfalfa weevil (*Hypera postica*), tobacco beetle (*Lasioderma serri-corne*), Colorado potato beetle (*Leptinotarsa decemlineata*), rice water weevil (*Lissohoptrus oryzophilus*), sweetpotato wireworm (*Melanotus fornumi*), sugarcane wireworm (*Melanotus tamsuyensis*), pollen beetle (*Meligethes aeneus*), Japanese pine sawyer (*Monochamus alternatus*), black vine weevil (*Otiorynchus sulcatus*), rice leaf beetle (*Oulema oryzae*), rove beetle (*Paederus fuscipes*), mustard leaf beetle (*Phaedon cochleariae*), striped flea beetle (*Phyllotreta striolata*), Japanese beetle (*Popillia japonica*), yellow-spotted longicorn beetle (*Psacothia hilaris*), solanum flea beetle (*Psylliodes angusticollis*), peach curculio (*Rhynchites heros*), granary weevil (*Sitophilus granarius*), maize weevil (*Sitophilus zeamais*), hunting billbug (*Sphenophorus venatus vestitus*), yellow mealworm (*Tenebrio molitor*), red flour beetle (*Tribolium castaneum*), and grape borer (*Xylotrechus pyrrhoderus*), Hymenoptera; chestnut sawfly (*Apethymus kuri*), large rose sawfly (*Arge pagana*), cabbage sawfly (*Athalia infumata*), turnip sawfly (*Athalia rosae*), Japanese carpenter ant (*Camponotus japonicus*), chestnut gall wasp (*Dryocosmus kuriphilus*), army ant (*Eciton burchellii*, *E. schmitti*), Argentine ant (*Linepithema humile*), pharaoh ant (*Monomorium pharaonis*), bulldog ant (*Myrmecia* spp.), European pine sawfly (*Neodiprion sertifer*), fire ant (*Solenopsis* spp.), Asian giant hornet (*Vespa mandarinia*), Japanese yellow hornet (*Vespa simillima*), Diptera; yellow fever mosquito (*Aedes aegypti*), Asian tiger mosquito (*Aedes albopictus*), *Aedes* spp., *Aedes taeniorhynchus*, rice leaf miner (*Agromyza oryzae*), Mexican fruit fly (*Anastrepha ludens*), African malaria mosquito (*Anopheles gambiae*), African malaria mosquito (*Anopheles hyrcanus sinensis*), *Anopheles koreicus*, *Anopheles lesteri*, *Anopheles maculipennis*, *Anopheles* spp., soybean pod gall midge (*Asphondylia yushimai*), *Atylotus* spp., melon fly (*Bactrocera cucurbitae*), oriental fruit fly (*Bactrocera dorsalis*), Queensland fruit fly (*Bactrocera tryoni*), Japanese orange fly (*Bactrocera tsuneonis*), *Boophthora erythrocephala*, *Braula coeca*, *Braula* spp., *Calliphora erythrocephala*, *Calliphora lata*, *Calliphora* spp., bottle fly (*Calliphora vicina*), Mediterranean fruit fly (*Ceratitidis capitata*), pea leaf miner (*Chromatomyia horticola*), Old World screw-worm fly (*Chrysomya bezziana*), blow fly (*Chrysomya chloropyga*), oriental latrine fly (*Chrysomya megacephala*), *Chrysomya* spp., splayed deerfly (*Chrysops caecutiens*), *Chrysops relictus*, *Chrysops* spp., deer fly (*Chrysops suavis*), *Chrysozona pluvialis*, New World screw-worm fly (*Cochliomyia hominivorax*), house mosquito (*Culex pipiens molestus*), house mosquito (*Culex pipiens pallens*), southern house mosquito (*Culex quinquefasciatus*), *Culex tarsalis*, *Culex tritaeniorhynchus*, *Culex* spp., biting midge (*Culicoides arakawae*), *Culicoides* spp., bot fly (*Cuterebra* spp.), onion fly (*Delia antiqua*), seed corn

maggot (*Delia platura*), human botfly (*Dermatobia hominis*), Japanese fruit fly (*Drosophila suzukii*), *Eusimulium* spp., lesser house fly (*Fannia canicularis*), *Fannia* spp., horse nose bot fly (*Gasterophilus haemorrhoidalis*), *Gasterophilus inermis*, horse bot fly (*Gasterophilus intestinalis*), throat bot fly (*Gasterophilus nasalis*), *Gasterophilus nigricornis*, *Gasterophilus pecorum*, *Gasterophilus* spp., tsetse fly (*Glossina morsitans*, *G. palpalis*), *Glossina* spp., horn fly (*Haematobia irritans*), *Haematobia irritans exigua*, *Haematobia* spp., *Haematobia stimulans*, *Haematopota italic*, common horse fly (*Haematopota pluvialis*), *Haematopota* spp., forest fly (*Hippobosca equina*), *Hippobosca* spp., *Hippobosca variegata*, *Hybomitra ciurea*, *Hybomitra* spp., smaller rice leaf miner (*Hydrellia griseola*), *Hydrotaea albipuncta*, sheep headfly (*Hydrotaea irritans*), *Hydrotaea* spp., warble fly (*Hypoderma bovis*), common cattle grub (*Hypoderma lineatum*), *Hypoderma* spp., black gnat (*Leptoconops nipponensis*), *Lipoptena capreoli*, *Lipoptena cervi*, *Lipoptena* spp., cabbage leafminer (*Liriomyza brassicae*), tomato leaf miner (*Liriomyza bryoniae*), stone leek leafminer (*Liriomyza chinensis*), pea leafminer (*Liriomyza huidobrensis*), tomato leafminer (*Liriomyza sativae*), serpentine leafminer (*Liriomyza trifolii*), Australian sheep blowfly (*Lucilia cuprina*), green bottle fly (*Lucilia illustris*), common green bottle fly (*Lucilia sericata*), *Lucilia* spp., *Lutzomyia* spp., hessian fly (*Mayetiola destructor*), sheep ked (*Melophagus ovinus*), *Melophagus* spp., sweat fly (*Morellia simplex*), *Morellia* spp., face fly (*Musca autumnalis*), housefly (*Musca domestica*), *Musca* spp., Australian bush fly (*Musca vetustissima*), *Odagmia ornate*, *Odagmia* spp., sheep nasal bot fly (*Oestrus ovis*), *Oestrus* spp., beet leaf miner (*Pegomya cunicularia*), *Philipomyia* spp., *Phlebotomus longipalpis*, *Phlebotomus papatasi*, sandfly (*Phlebotomus* spp.), black blow fly (*Phormia regina*), *Prosimulium yezoensis*, northern blowfly (*Protophormia terraenovae*), *Przhevalskiana silenus*, apple maggot (*Rhagoletis pomonella*), *Rhinoestrus* spp., flesh fly (*Sarcophaga carnaria*), flesh fly (*Sarcophaga peregrina*), *Sarcophaga* spp., black fly (*Simulium ochraceum*), *Simulium reptans*, *Simulium* spp., orange wheat blossom midge (*Sitodiplosis mosellana*), stable fly (*Stomoxys calcitrans*), *Stomoxys* spp., *Tabanus atratus*, *Tabanus bromius*, greenhead horse fly (*Tabanus nigrovittatus*), *Tabanus spodopterus*, *Tabanus* spp., *Tabanus sudeticus*, horse fly (*Tabanus trigonus*), moth fly (*Telmatoscopus albipunctatus*), *Tipula paludosa*, *Tipula* spp., *Wilhelmia equine*, *Wilhelmia* spp., and *Wohlfahrtia* spp.,

Heteroptera (Hemiptera); green stink bug (*Acrosternum hilare*), pea aphid (*Acyrtosiphon pisum*), camellia spiny whitefly (*Aleurocanthus camelliae*), orange spiny whitefly (*Aleurocanthus spiniferus*), Indian cotton leafhopper (*Amrasca devastans*), California red scale (*Aonidiella aurantii*), cowpea aphid (*Aphis craccivora*), black bean aphid (*Aphis fabae*), soybean aphid (*Aphis glycines*), cotton aphid (*Aphis gossypii*), green apple aphid (*Aphis pomi*), spiraea aphid (*Aphis spiraeicola*), pale greenplant bug (*Apolygus spinolae*), grape leafhopper (*Arboridia apicalis*), foxglove aphid (*Aulacorthum solani*), Beardsley leafhopper (*Balclutha saltuella*), silverleaf whitefly (*Bemisia argentifolii*), sweetpotato whitefly (*Bemisia tabaci*), true chinch bug (*Blissus leucopterus*), leafcurl plum aphid (*Brachycaudus helichrysi*), cabbage aphid (*Brevicoryne brassicae*), oriental chinch bug (*Cavelerius saccharivorus*), Indian wax scale (*Ceroplastes ceriferus*), red wax scale (*Ceroplastes rubens*), walnut aphid (*Chromaphis juglandicola*), bed bug (*Cimex lectularius*), rice stink bug (*Cletus punctiger*), citricola scale (*Coccus pseudomagnoliarum*), San Jose scale (*Comstockaspis perniciosus*), citrus whitefly (*Dialeurodes citri*), Asian citrus psyllid (*Diaphorina citri*), *Dichelops furcatus*, Russian wheat aphid (*Diuraphis noxia*), sloe bug (*Dolycoris baccarum*), giant margarodid scale (*Drosicha corpulenta*), rosy apple aphid (*Dysaphis plantaginea*), red cotton bug (*Dysdercus cingulatus*), potato leafhopper (*Empoasca fabae*), *Empoasca nipponica*, tea green leafhopper (*Empoasca onukii*), bean's smaller green leafhopper (*Empoasca sakaii*), grape leafhopper (*Epiacanthus stramineus*), wooly apple aphid (*Eriosoma lanigerum*), cabbage bug (*Eurydema rugosa*), brown stink bug (*Euschistus servus*), white-spotted spined bug (*Eysarcoris aeneus*), *Eysarcoris lewisi*, white-spotted stink bug (*Eysarcoris ventralis*), tea scale (*Fiorinia theae*), shield bug (*Glaucias subpunctatus*), island fleahopper (*Halticus insularis*), brown marmorated stink bug (*Halyomorpha halys*), mealy plum aphid (*Hyalopterus pruni*), cottony cushion scale (*Icerya purchasi*), small brown planthopper (*Laodelphax striatellus*), rice bug (*Leptocorisa chinensis*), turnip aphid (*Lipaphis erysimi*), western tarnished plant bug (*Lygus hesperus*), tarnished plant bug (*Lygus lineolaris*), potato aphid (*Macrosiphum euphorbiae*), aster leafhopper (*Macrostoteles fascifrons*), grape Leafhopper (*Macrostoteles striifrons*), sugarcane spittlebug (*Mahanarva fimbriolata*), black-margined aphid (*Monellia caryella*), green peach aphid (*Myzus persicae*), lettuce aphid (*Nasonovia ribisnigri*), onion aphid (*Neotoxoptera formosana*), green rice leafhopper (*Nephotettix cincticeps*), eastern green stink bug (*Nezara antennata*), southern green stink bug (*Nezara viridula*), brown rice planthopper (*Nilaparvata lugens*), squash bug (*Paradasynus spinosus*), cotton mealy bug (*Phenacoccus solani*), red-banded stink bug (*Piezodorus guildinii*), red-banded shield bug (*Piezodorus hybneri*), citrus mealybug (*Planococcus citri*), Japanese mealybug (*Planococcus kraunhiae*), brown-winged green bug (*Plautia crossota*), peony scale (*Pseudaulacaspis paeoniae*), cotton fleahopper (*Pseudatomoscelis seriatus*), mulberry scale (*Pseudaulacaspis pentagona*), white peach scale (*Pseudaulacaspis prunicola*), Comstock mealybug (*Pseudococcus comstocki*), grape mealybug (*Pseudococcus maritimus*), pear sucker (*Psylla pyrisuga*), blood-sucking bug (*Rhodnius prolixus*), bird cherry-oat aphid (*Rhopalosiphum padi*), rice root aphid (*Rhopalosiphum rufiabdominalis*), rhopalid bug (*Rhopalus maculatus*), bean bug (*Riptortus clavatus*), greenbug (*Schizaphis graminum*), Japanese black rice bug (*Scotinophora lurida*), corn leaf aphid (*Sitobion akebiae*), English grain aphid (*Sitobion avenae*), white-backed rice planthopper (*Sogatella furcifera*), rice stink bug (*Stenodema*

sibiricum), sorghum plant bug (*Stenotus rubrovittatus*), azalea lace bug (*Stephanitis pyrioides*), seed bug (*Togo hemipterus*), black citrus aphid (*Toxoptera aurantii*), brown citrus aphid (*Toxoptera citricida*), greenhouse whitefly (*Trialeurodes vaporariorum*), kissing bug (*Triatoma dimidiata*), kissing bug (*Triatoma infestans*), rice leaf bug (*Trigonotylus caelestialium*), citrus snow scale (*Unaspis citri*), euonymus scale (*Unaspis euonymi*), arrowhead scale (*Unaspis yanonensis*), and grape phylloxera (*Viteus vitifolii*),
 Thysanoptera; flower thrips (*Frankliniella intonsa*), western flower thrips (*Frankliniella occidentalis*), greenhouse thrips (*Heliothrips haemorrhoidalis*), Japanese gall-forming thrips (*Ponticulothrips diospyrosi*), yellow tea thrips (*Scirtothrips dorsalis*), melon thrips (*Thrips palmi*), and onion thrips (*Thrips tabaci*),
 Orthoptera; Australian plague locust (*Chortoicetes terminifera*), oriental mole cricket (*Gryllotalpa orientalis*), migratory locust (*Locusta migratoria*), lesser paddy grasshopper (*Oxya japonica*), rice grasshopper (*Oxya yezoensis*), desert locust (*Schistocerca gregaria*), and emma field cricket (*Teleogryllus emma*),
 Blattodea (Dictyoptera); German cockroach (*Blattella germanica*), Formosan subterranean termite (*Coptotermes formosanus*), daikoku dry-wood termite (*Cryptotermes domesticus*), western dry-wood termite (*Incisitermes minor*), black-winged subterranean termite (*Odontotermes formosanus*), American cockroach (*Periplaneta americana*), smoky-brown cockroach (*Periplaneta fuliginosa*), Japanese cockroach (*Periplaneta japonica*), and Japanese subterranean termite (*Reticulitermes speratus*),
 Isoptera; *Coptotermes formosanus*, *Reticulitermes speratus*, and *Odontotermes formosanus*,
 Acari; cyclamen mite (*Phytonemus pallidus*), broad mite (*Polyphagotarsonemus latus*), *Tarsonemus bilobatus*, *Penthaleus erythrocephalus*, winter grain mite (*Penthaleus major*), rice spider mite (*Oligonychus shinkajii*), citrus red mite (*Panonychus citri*), *Panonychus mori*, European red mite (*Panonychus ulmi*), Kanzawa spider mite (*Tetranychus kanzawai*), two-spotted spider mite (*Tetranychus urticae*), *Acaphylla theavagrans*, dry bulb mite (*Aceria tulipae*), tomato erineum mite (*Aculops lycopersici*), pink citrus rust mite (*Aculops pelekassi*), apple rust mite (*Aculus schlechtendali*), *Eriophyes chibaensis*, *Phyllocoptruta oleivora*, bulb mite (*Rhizoglyphus robini*), mold mite (*Tyrophagus putrescentiae*), *Tyrophagus similis*, *Acarapis* spp., honey bee tracheal mite (*Acarapis woodi*), *Acarus* spp., lone star tick (*Amblyomma americanum*), cayenne tick (*Amblyomma cajennense*), South African bont tick (*Amblyomma hebraeum*), gulf coast tick (*Amblyomma maculatum*), *Amblyomma* spp., tropical bont tick (*Amblyomma variegatum*), fowl tick (*Argas persicus*), pigeon tick (*Argas reflexus*), *Argas* spp., blue cattle tick (*Boophilus annulatus*), *Boophilus calceatus*, African blue tick (*Boophilus decoloratus*), tropical cattle tick (*Boophilus microplus*), *Boophilus* spp., *Caloglyphus* spp., *Chelacaropsis moorei*, *Cheyletiella blakei*, rabbit fur mite (*Cheyletiella parasitivorax*), *Cheyletiella* spp., *Cheyletiella yasguri*, *Cheyletus eruditus*, *Cheyletus malaccensis*, chorioptic mange mite (*Chorioptes bovis*), *Chorioptes* spp., *Cytodites* spp., cattle follicle mite (*Demodex bovis*), *Demodex caballi*, dog follicle mite (*Demodex canis*), *Demodex caprae*, cat follicle mite (*Demodex cati*), *Demodex equi*, face mite (*Demodex folliculorum*), *Demodex ovis*, *Demodex* spp., *Sarcoptes suis* mite (*Demodex suis*), winter tick (*Dermacentor albipictus*), Rocky Mountain wood tick (*Dermacentor andersoni*), ornate sheep tick (*Dermacentor marginatus*), meadow tick (*Dermacentor pictus*), ornate dog tick (*Dermacentor reticulatus*), *Dermacentor* spp., American dog tick (*Dermacentor variabilis*), poultry red mite (*Dermanyssus gallinae*), *Dermanyssus* spp., American house dust mite (*Dermatophagoides farina*), house dust mite (*Dermatophagoides pteronyssinus*), *Eutrombicula wichmanni*, storage mite (*Glycyphagus destructor*), house itch mite (*Glycyphagus domesticus*), *Haemaphysalis cinnabarina*, common rodent tick (*Haemaphysalis concinna*), yellow dog tick (*Haemaphysalis leachi*), bush tick (*Haemaphysalis longicornis*), *Haemaphysalis otophila*, red sheep tick (*Haemaphysalis punctate*), *Haemaphysalis* spp., *Haplochthonius simplex*, trombiculid mite (*Helenicula miyagawai*), tortoise tick (*Hyalomma aegyptium*), *Hyalomma anatolicum*, bont-legged tick (*Hyalomma marginatum*), *Hyalomma mauritanicus*, *Hyalomma* spp., small smooth bont-legged tick (*Hyalomma transiens*), *Hypodectes* spp., dog tick (*Ixodes canisuga*), hedgehog tick (*Ixodes hexagonus*), Australian paralysis tick (*Ixodes holocyclus*), western black-legged tick (*Ixodes pilosus*), castor bean tick (*Ixodes ricinus*), karoo paralysis tick (*Ixodes rubicundus*), deer tick (*Ixodes scapularis*), *Ixodes* spp., *Knemidocoptes* spp., *Laminosioptes* spp., *Leptotrombidium akamushi*, *Leptotrombidium pallida*, tsutsugamushi mite (*Leptotrombidium scutellare*), *Listrophorus* spp., feather mite (*Megninia cubitalis*), *Myobia* spp., *Neoschoengastia xerothermobia*, harvest mite (*Neotrombicula autumnalis*), *Neotrombicula desaleri*, cat mange mite (*Notoedres cati*), *Notoedres* spp., *Ornithocheyletia* spp., soft tick (*Ornithodoros moubata*), *Ornithodoros* spp., tropical fowl mite (*Ornithonyssus bursa*), *Ornithonyssus* spp., northern fowl mite (*Ornithonyssus sylviarum*), spinose ear tick (*Otobius megnini*), *Otobius* spp., dog ear mite (*Otodectes cynotis*), *Otodectes* spp., canine nasal mite (*Pneumonyssoides caninum*), *Pneumonyssoides mange*, *Pneumonyssus* spp., *Pneumonyssus* spp., *Psorergates* spp., psoroptic mite (*Psoroptes communis*), rabbit ear mite (*Psoroptes cuniculi*), *Psoroptes equi*, sheep scab mite (*Psoroptes ovis*), *Psoergates ovis* (*Psoroptes ovis*), *Psoroptes* spp., feather mite (*Pterolichus obtusus*), *Pterolichus* spp., *Raillietia* spp., brown ear tick (*Rhipicephalus appendiculatus*), brown ear tick (*Rhipicephalus bursa*), *Rhipicephalus capensis*, Asian blue tick (*Rhipicephalus evertsi*), kennel tick (*Rhipicephalus sanguineus*), *Rhipicephalus* spp., *Rhipicephalus turanicus*, *Rhipicephalus zambeziensis*, *Sarcoptes bovis*, *Sarcoptes equi*, *Sarcoptes ovis*, *Sarcoptes rupicaprae* (= *S. caprae*), itch mite (*Sarcoptes scabiei*), *Sarcoptes* spp., *Sarcoptes suis*, itch mite (*Sarcoptes canis*), *Sternostoma* spp., *Trombicula akamushi*, *Trombicula*

spp., cheese mite (*Tyrophagus putrescentiae*), *Tyrophagus* spp., varroa mite (*Varroa jacobsoni*), and *Varroa* spp., Phthiraptera (Anoplurida); short-nosed cattle louse (*Haematopinus eurysternus*), tail switch louse (*Haematopinus quadripertusus*), *Haematopinus* spp., large pig louse (*Haematopinus suis*), buffalo louse (*Haematopinus tuberculatus*), rabbit louse (*Haemodipsus ventricosus*), dog sucking louse (*Linognathus setosus*), *Linognathus* spp., long-nosed cattle louse (*Linognathus vituri*), head louse (*Pediculus humanus*), *Pediculus* spp., mouse louse (*Polyplax serratus*), crab louse (*Pthirus pubis*), *Pthirus* spp., little blue cattle louse (*Solenopotes capillatus*), and *Solenopotes* spp.,

Mallophaga; goat biting louse (*Bovicola caprae*), *Bovicola limbata*, sheep body louse (*Bovicola ovis*), *Bovicola* spp., chicken head louse (*Cuclotogaster heterographa*), cattle chewing louse (*Damalinia bovis*), *Felicola* spp., cat louse (*Felicola subrostrata*), brown chicken louse (*Goniodes dissimilis*), fluff louse (*Goniodes gallinae*), large hen louse (*Goniodes gigas*), *Lepikentron ovis*, *Lepikentron* spp., wing louse (*Lipeurus caponis*), body louse (*Menacanthus cornutus*), small body louse (*Menacanthus pallidulus*), *Menacanthus* spp., chicken body louse (*Menacanthus stramineus*), chicken shaft louse (*Menopon gallinae*), *Menopon* spp., dog biting louse (*Trichodectes canis*), *Trichodectes* spp., *Werneckiella equi*, and *Werneckiella* spp., and

Siphonaptera; hen flea (*Ceratophyllus gallinae*), dog flea (*Ctenocephalides canis*), cat flea (*Ctenocephalides felis*), sticktight flea (*Echidnophaga gallinacean*), human flea (*Pulex irritans*), chigoe flea (*Tunga penetrans*), and oriental rat flea (*Xenopsylla cheopis*), and

examples of other parasites include:

monogeneans (Monogenea); *Benedenia epinepheli*, *Benedenia hoshinai*, *Benedenia sekii*, *Benedenia seriola*, *Bivagina tai*, sea louse (*Caligus curtus*), *Caligus elongates*, *Caligus labracis*, *Caligus longipedis*, *Caligus orientalis*, *Caligus teres*, *Dactylogyrus* spp., *Gyrodactylus* spp., *Heteraxine heterocerca*, *Heterobothrium okamotoi*, *Lamello-discus* spp., copepod (*Lepeophtheirus cuneifer*), *Lepeophtheirus hippoglossi*, *Lepeophtheirus pectoralis*, salmon louse (*Lepeophtheirus salmonis*), *Microcotyle sebastis*, *Microcotyle sebastisci*, *Neobenedenia*, *Neobenedenia congeri*, *Neobenedenia girellae*, *Neoheterobothrium hirame*, *Polystoma* spp., *Pseudocaligus fugu*, and *Zeuxapta japonica*,

cestodes (Cestoda); *Andrya* spp., *Anoplocephala* spp., *Avitellina* spp., *Bertiella* spp., *Bothridium* spp., *Cittotaenia* spp., *Davainea* spp., *Diorchis* spp., Manson's tapeworm (*Diphylobothrium erinacei*), fish tapeworm (*Diphylobothrium latum*), *Diphylobothrium* spp., *Diphylogonoporus* spp., *Diplopylidium* spp., dog tapeworm (*Dipylidium caninum*), *Dipylidium* spp., dog tapeworm (*Echinococcus granulosus*), fox tapeworm (*Echinococcus multilocularis*), *Echinococcus* spp., *Echinocotyle* spp., *Echinolepsis* spp., *Hydatigera* spp., *Hymenolepis diminuta*, *Hymenolepis* spp., *Joyeuxiella* spp., *Ligula* spp., *Mesocestoides* spp., *Moniezia benedeni*, *Moniezia* spp., *Paranoplocephala* spp., *Raillietina* spp., *Schistocephalus* spp., *Spirometra* spp., *Stilesia* spp., beef tapeworm (*Taenia saginata*), pork tapeworm (*Taenia solium*), *Taenia* spp., cat tapeworm (*Taenia taeniaeformis*), *Thysaniezia* spp., and *Thysanosoma* spp., trematodes (Trematoda); *Austrobilharzia* spp., *Brachylaema* spp., *Calicophoron* spp., *Catantropis* spp., Chinese river fluke (*Clonorchis sinensis*), *Clonorchis* spp., *Collyriclum* spp., *Cotylophoron* spp., *Cyclocoelum* spp., *Dicrocoelium* spp., *Diplostomum* spp., *Echinocasmus* spp., *Echinoparyphium* spp., *Echinostoma* spp., *Eurytrema coelomaticum*, pancreas fluke (*Eurytrema pancreaticum*), *Eurytrema* spp., liver fluke (*Fasciola gigantica*), sheep liver fluke (*Fasciola hepatica*), *Fasciola* spp., *Fasciolides* spp., large intestinal fluke (*Fasciolopsis buski*), *Fasciolopsis* spp., *Fischederius* spp., *Gastrothylacus* spp., *Gigantobilharzia* spp., *Gigantocotyle* spp., *Heterophyes* spp., *Hypoderaeum* spp., *Leucochloridium* spp., *Metagonimus* spp., *Metorchis* spp., *Nanophyetus* spp., *Notocotylus* spp., *Opisthorchis* spp., *Ornithobilharzia* spp., *Paragonimus* spp., oriental lung fluke (*Paragonimus westermani*), *Paramphistomum* spp., *Plagiorchis* spp., *Posthodiplostomum* spp., *Prosthogonimus* spp., urinary blood fluke (*Schistosoma haematobium*), oriental blood fluke (*Schistosoma japonicum*), *Schistosoma mansoni*, *Schistosoma* spp., *Trichobilharzia* spp., *Trogloctrema* spp., and *Typhlocoelum* spp.,

nematodes (Nematoda); *Aelurostrongylus* spp., *Amidostomum* spp., *Ancylostoma* spp., *Angiostrongylus* spp., *Anisakis* spp., chicken roundworm (*Ascaridia galli*), *Ascaridia* spp., *Ascaris* spp., pig roundworm (*Ascaris suum*), *Aspicularis* spp., *Brugia* spp., *Bunostomum* spp., *Capillaria* spp., *Chabertia* spp., intestinal worm (*Cooperia oncophora*), *Cooperia* spp., *Crenosoma* spp., *Cyathostoma* spp., *Cyclococercus* spp., *Cylicostephanus* spp., *Cylindropharynx* spp., *Cystocaulus* spp., *Dictyocaulus* spp., dog filaria (*Dirofilaria immitis*), *Dirofilaria* spp., *Dracunculus* spp., *Draschia* spp., *Elaphostrongylus* spp., *Enoplida*, *Enterobius* spp., *Filaroides* spp., *Filicollis* spp., *Globocephalus* spp., *Gnathostoma* spp., *Gongylonema* spp., *Gyaloccephalus* spp., *Habronema* spp., barber's pole worm (*Haemonchus contortus*), *Haemonchus* spp., *Heterakis* spp., *Hyostomylus* spp., *Litomosoides* spp., *Loa* spp., *Macracanthorhynchus* spp., *Marshallagia* spp., *Metastrongylus* spp., *Micronema* spp., *Moniliformis* spp., *Muellerius* spp., *Nematodirus* spp., *Neostrongylus* spp., *Obeliscoides* spp., *Oeophagostomum dentatum*, *Oesophagodontus* spp., *Oesophagostomum radiatum*, *Oesophagostomum* spp., *Ollulanus* spp., *Onchocerca gibsoni*, *Onchocerca* spp., brown stomach worm (*Ostertagia ostertagi*), *Ostertagia* spp., *Oxyuris* spp., *Parabronema* spp., *Paracrenosoma* spp.,

Parafilaria spp., *Parafilaroides* spp., *Parascaris* spp., *Parelaphostrongylus* spp., *Passalurus* spp., *Physaloptera* spp., *Pneumostrongylus* spp., *Poteriostomum* spp., *Prostenorchis* spp., *Protostrongylus* spp., *Setaria* spp., *Spicocaulus* spp., *Stephanofilaria* spp., *Stephanurus* spp., *Strongyloides* spp., *Strongylus* spp., *Syngamus* spp., *Syphacia* spp., *Thelazia* spp., *Toxascaris* spp., *Toxocara* spp., *Trichinella* spp., *Trichomosoides* spp., Enoplidae (*Trichonema* spp.), ruminant nematode (*Trichostrongylus colubriformis*), *Trichostrongylus* spp., *Trichuris* spp., *Triodontophorus* spp., *Uncinaria* spp., and *Wuchereria* spp., and protozoans (Protozoa); *Babesia* spp., *Eimeria acervulina*, *Eimeria bovis*, *Eimeria brunette*, *Eimeria maxima*, *Eimeria necatrix*, *Eimeria ovinoidalis*, *Eimeria* spp., *Eimeria tenella*, *Entamoeba histolytica*, *Giardia* spp., *Histomonas* spp., *Plasmodium* spp., *Theileria* spp., *Toxoplasma* spp., *Trichomonadidae* spp., and *Trypanosoma cruzi*.

[0111] In addition, the presently invented compound is effective for pests that have developed resistance to an existing insecticide such as an organophosphorus compound, a carbamate compound, and a pyrethroid compound.

[0112] Specifically, the presently invented compound can effectively control pests belonging to insects such as Collembola, Dictyoptera (Blattodea), Orthoptera, Isoptera, Thysanoptera, Hemiptera (Heteroptera and Homoptera), Lepidoptera, Coleoptera, Hymenoptera, Diptera, Isoptera (Siphonaptera), and Phthiraptera, crustaceans such as Arguloida, Siphonostomatoida and Cyclopoida, mites, gastropods, cestodes, trematodes, nematodes, protozoans, and so on, at low concentration.

[0113] On the other hand, the presently invented compound has a very useful feature to cause almost no adverse effect on mammals, fishes, crustaceans, and beneficial insects (useful insects such as honeybees and bumblebees, and natural enemies such as Aphelinidae, Aphidiinae, tachinid fly, *Orius* spp., and Phytoseiidae).

[0114] In using the presently invented compound, typically, the presently invented compound is mixed with a proper solid carrier or liquid carrier with addition of a surfactant, a penetrant, a spreader, a thickening agent, an antifreezing agent, a binder, an anticaking agent, a disintegrant, a defoamer, a preservative, an antidegradant, or any other agent, as desired, and the resultant can be formulated into a formulation of an arbitrary dosage form such as a soluble concentrate, an emulsifiable concentrate, a wettable powder, a water-soluble powder, a water-dispersible granule, a water-soluble granule, a suspension concentrate, a concentrated emulsion, a suspoemulsion, a microemulsion, a dustable powder, a granule tablet, and an emulsifiable gel for practical use. For labor saving and enhanced safety, the formulation of an arbitrary dosage form can be encapsulated for use in a water-soluble capsule or a water-soluble package such as a bag of a water-soluble film.

[0115] Examples of the solid carrier include natural mineral materials such as quartz, calcite, meerschaum, dolomite, chalk, kaolinite, pyrophyllite, sericite, hallosite, metahallosite, kibushi clay, gairome clay, pottery stone, ZEEKLITE, allophane, shirasu, mica, talc, bentonite, activated clay, acid clay, pumice, attapulgit, zeolite, and diatomaceous earth; calcined products of natural mineral materials such as calcined clay, perlite, silas balloons, vermiculite, attapulgit, and calcined diatomaceous earth; inorganic salts such as magnesium carbonate, calcium carbonate, sodium carbonate, sodium hydrogen carbonate, ammonium sulfate, sodium sulfate, magnesium sulfate, diammonium hydrogen phosphate, ammonium dihydrogen phosphate, and potassium chloride; saccharides such as glucose, fructose, sucrose, and lactose; polysaccharides such as starch, powdered cellulose, and dextrin; organic substances such as urea, urea derivatives, benzoic acid, and salts of benzoic acid; plant materials such as wood powder, cork powder, corn rachises, walnut shells, and tobacco stems; fly ash, white carbon (e.g., hydrated synthetic silica, anhydrous synthetic silica, hydrated synthetic silicate), and fertilizers.

[0116] Examples of the liquid carrier include aromatic hydrocarbons such as xylene, alkyl (such as C₉ or C₁₀) benzene, phenylxylethane, and alkyl (such as C₁ or C₃) naphthalene; aliphatic hydrocarbons such as machine oil, normal paraffin, isoparaffin, and naphthene; mixtures of aromatic hydrocarbon and aliphatic hydrocarbon such as kerosene; alcohols such as ethanol, isopropyl alcohol, cyclohexanol, phenoxyethanol, and benzyl alcohol; polyhydric alcohols such as ethylene glycol, propylene glycol, diethylene glycol, hexylene glycol, polyethylene glycol, and polypropylene glycol; ethers such as propylcellosolve, butylcellosolve, phenylcellosolve, propylene glycol monomethyl ether, propylene glycol monoethyl ether, propylene glycol monopropyl ether, propylene glycol monobutyl ether, and propylene glycol monophenyl ether; ketones such as acetophenone, cyclohexanone, and γ -butyrolactone; esters such as aliphatic acid methyl esters, succinic acid dialkyl esters, glutamic acid dialkyl esters, adipic acid dialkyl esters, and phthalic acid dialkyl esters; acid amides such as N-alkyl (such as C₁, C₈ or C₁₂) pyrrolidone; fats and oils such as soybean oil, linseed oil, rapeseed oil, coconut oil, cottonseed oil, and castor oil; and dimethyl sulfoxide and water.

[0117] One of those solid carriers and liquid carriers may be used singly; alternatively, two or more thereof may be used in combination.

[0118] Examples of the surfactant include nonionic surfactants such as polyoxyethylene alkyl ethers, polyoxyethylene alkyl (mono or di)phenyl ethers, polyoxyethylene (mono, di or tri)styrylphenyl ethers, polyoxyethylene polyoxypropylene block copolymers, polyoxyethylene fatty acid (mono or di)esters, sorbitan fatty acid esters, polyoxyethylene sorbitan fatty acid esters, a castor oil ethylene oxide adduct, acetylene glycol, acetylene alcohol, an ethylene oxide adduct of acetylene glycol, an ethylene oxide adduct of acetylene alcohol, and alkyl glycosides; anionic surfactants such as alkylsulfate salts,

alkylbenzenesulfonic acid salts, ligninsulfonic acid salts, alkylsulfosuccinic acid salts, naphthalenesulfonic acid salts, alkylnaphthalenesulfonic acid salts, salts of a formalin condensate of naphthalenesulfonic acid, salts of a formalin condensate of alkylnaphthalenesulfonic acid, polyoxyethylene alkyl ether sulfonate or phosphate salts, polyoxyethylene (mono or di) alkylphenyl ether sulfonate or phosphate salts, polyoxyethylene (mono, di or tri) styrylphenyl ether sulfonate or phosphate salts, polycarboxylic acid salts (e.g., polyacrylic acid salts, polymaleic acid salts, copolymers of maleic acid and an olefin), and polystyrenesulfonic acid salts; cationic surfactants such as alkylamine salts and alkyl quaternary ammonium salts; amphoteric surfactants such as those of amino acid type and betaine type; and silicone surfactants, and fluorine-containing surfactants.

[0119] The surfactant content for those surfactants is not limited to a particular value, but desired to be in the range of 0.05 to 20 parts by mass relative to 100 parts by mass of the presently invented compound in typical cases. One of those surfactants may be used singly; alternatively, two or more thereof may be used in combination.

[0120] The amount of application of the presently invented compound depends on the situation of application, time of application, application method, cultivated crop, etc., and about 0.005 to 50 kg per hectare (ha), as an amount of the active ingredient, is appropriate in typical cases.

[0121] In using the presently invented compound for controlling internal or external parasites in mammals and birds as livestock and pets, an effective amount of the presently invented compound can be administered together with formulation excipients, for example, by: oral administration; parenteral administration such as injection (intramuscular, subcutaneous, intravenous, intraperitoneal, etc.); transdermal administration such as soaking, spraying, bathing, washing, pouring-on and spotting-on, and dusting; or transnasal administration. The presently invented compound can be administered in the form of a shaped product with a slip, a plate, a band, a collar, an ear mark, a limb band, an indicator, or the like.

[0122] In administration, the presently invented compound can be formulated into an arbitrary dosage form suitable for the route of administration.

[0123] In eliminating an external or internal parasite with the presently invented compound, the preferred dose of presently invented compound (1) depends on the type of the target parasite to be controlled, the species of the target animal to be subjected to administration, the administration method, or any other factor, and is 0.01 to 100 mg/kg, and preferably 0.01 to 50 mg/kg per body weight of the target animal to be subjected to administration in typical cases. In particular, the dose for dogs, which can depend on the breed or age of the targeted dog or the external parasite to be controlled, is typically 1 to 5000 mg/kg, and preferably 1 to 100 mg/kg per 1 kg fresh weight of the targeted dog.

[0124] In eliminating an external or internal parasite by administering the presently invented compound, the frequency of administration depends on the type of the target parasite to be controlled, the species of the target animal to be subjected to administration, the administration method, or any other factor, and can be arbitrarily set in the range, from every day to once a year in typical cases. The frequency of administration is preferably once a week to once per six months, and more preferably every day (every 24 hours), every month, once a month, once every two months, once every three months, or once every six months.

[0125] For time of administration to a dog in using the presently invented compound for controlling an external parasite in a dog, for example, the presently invented compound is orally administered to a dog at a time immediately 30 minutes before the beginning of feeding or 120 minutes after the end of feeding. The time 30 minutes before the beginning of feeding and the time 120 minutes after the end of feeding are based on an act of eating a feed given to a dog for the purpose of nutrient intake. In the case that a dog is allowed to have a feeding time of 20 minutes, for example, the specified time is between the time 30 minutes before the beginning of feeding and the time 120 minutes after the end of feeding, within 170 minutes in total, on the basis of an act of having a meal. Also included is the case that feeding is temporarily suspended in the middle of the feeding, the presently invented compound is orally administered, and then feeding is restarted. The word feeding herein refers to an act of eating a feed by an animal.

[0126] The number of the feeding of a dog in a day depends on dog breed, age, and habit, and is typically said to be three to four times per day for dogs younger than half a year of age, twice to three times per day for dogs older than half a year of age and younger than a year of age, twice per day for about one- to five-year old adult dogs, and about twice to three times per day for six-year-old or older senior dogs. In the present invention, the word feeding refers to an act of eating for the purpose of taking nutrients, and an act of giving a feed or the like that is intended to be given for what is called teaching or training a dog is not included.

[0127] Examples of the arbitrary dosage form to be prepared include solid preparations such as powders, granules, wettable powders, pellets, tablets, boluses, capsules, and shaped products containing the active compound; liquid preparations such as solutions and emulsions for injection, solutions and emulsions for oral administration, and solutions and emulsions for use on skin or in a body cavity; solution preparations such as pour-on agents, spot-on agents, suspension concentrates, and emulsions; and semi-solid preparations such as salves and ointments and gels.

[0128] Examples of the dosage form for oral administration of the presently invented compound include solid preparations such as tablets, chewables, capsules, pills, boluses, granules, and powders; semi-solid preparations such as pastes and gels, and liquid preparations such as drinks.

[0129] Examples of the dosage form for transdermal administration include solid preparations such as powders; semi-

solid preparations such as creams, salves and ointments, pastes, and gels; and liquid preparations such as sprays, aerosols, solutions and emulsions, suspensions, and lotions.

[0130] Examples of the dosage form for administration by injection include liquid preparations such as solutions and emulsions and suspensions, and examples of the dosage form for transnasal administration include liquid preparations such as aerosols.

[0131] Examples of the dosage form for sprinkling in an animal-housing environment such as livestock sheds include solid preparations such as wettable powders, dusts, and granules; and liquid preparations such as emulsions and suspension concentrates.

[0132] It should be noted that formulations to be used for the parasiticide of the present invention are not limited to those dosage forms.

[0133] A solid preparation can be directly orally administered, or transdermally administered after diluting with water, or used, for example, by sprinkling in an animal-housing environment such as livestock sheds.

[0134] A solid preparation to be used for oral administration can be prepared by mixing presently invented compound (1) or a salt thereof and one or two or more diluents and binders suitable for oral administration, and, if necessary, a physiologically acceptable excipient such as a lubricant, a disintegrant, a dye, and a pigment, and shaping the resultant to give a desired shape.

[0135] Examples of the diluents and binders include saccharides or saccharide derivatives such as lactose, sucrose, mannitol, and sorbitol; starches such as corn starch, wheat starch, rice starch, and potato starch; celluloses or cellulose derivatives such as methylcellulose, carboxymethylcellulose, hydroxyethylcellulose, hydroxypropylcellulose, and hydroxypropylmethylcellulose; proteins or protein derivatives such as zein and gelatin; and honey, gum arabic mucilage, and synthetic polymer compounds such as polyvinyl alcohol and polyvinylpyrrolidone.

[0136] Examples of the lubricant include magnesium stearate, and examples of the disintegrant include cellulose, agar, alginic acid, crosslinked polyvinylpyrrolidinone, and carbonic acid salts.

[0137] In particular, for solid agents such as chewable agents among solid preparations for use in oral administration, excipients that impart taste, texture, and flavor preferred by animals to be subjected to administration are also used, but carriers and excipients for use in solid preparations of the pesticide composition are not limited thereto.

[0138] For example, a liquid preparation can be directly administered transdermally or by injection, or mixed with an animal feed and orally administered, or orally administered after dilution with water, or transdermally administered, or sprinkled in an animal-housing environment such as livestock sheds.

[0139] A solution or emulsion for injection can be intravenously, intramuscularly, or subcutaneously administered. A solution or emulsion for injection can be prepared by dissolving the active compound in a proper solvent and, if necessary, adding an excipient such as a solubilizer, an acid, a base, a buffering salt, an antioxidant, and a protectant.

[0140] Examples of the proper solvent include water, ethanol, butanol, benzyl alcohol, glycerin, propylene glycol, polyethylene glycol, N-methylpyrrolidone, a mixture of any of them, physiologically acceptable vegetable oil, and synthetic oil suitable for injection.

[0141] Examples of the solubilizer include polyvinylpyrrolidone, polyoxyethylated castor oil, and polyoxyethylated sorbitan ester.

[0142] Examples of the protectant include benzyl alcohol, trichlorobutanol, p-hydroxybenzoic acid ester, and n-butanol.

[0143] A solution or emulsion for oral administration can be administered directly or with dilution. A solution or emulsion for oral administration can be prepared in the same manner as for the solution or emulsion for injection.

[0144] A suspension concentrate, an emulsion, or the like can be administered directly or with dilution, transdermally, or by environmental process.

[0145] A solution or emulsion for use on skin can be administered by dropping, spreading, rubbing, spraying, or sprinkling, or applying by soaking (soaking, bathing or washing). Such a solution or emulsion can be prepared in the same manner as for the solution or emulsion for injection.

[0146] A pour-on agent and spot-on agent can be allowed to systemically act by dropping at a limited position on skin or spraying thereon to soak the skin with the active compound.

[0147] A pour-on agent and spot-on agent can be prepared by dissolving, suspending, or emulsifying active ingredients in a proper skin-compatible solvent or solvent mixture. If necessary, an auxiliary agent such as a surfactant, a coloring agent, an absorption promoter, an antioxidant, a photostabilizer, and an adhesive may be added.

[0148] Examples of the proper solvent include water, alkanol, glycol, polyethylene glycol, polypropylene glycol, glycerin, benzyl alcohol, phenylethanol, phenoxyethanol, ethyl acetate, butyl acetate, benzyl benzoate, dipropylene glycol monomethyl ether, diethylene glycol monobutyl ether, acetone, methyl ethyl ketone, aromatic and/or aliphatic hydrocarbons, vegetable or synthetic oil, DMF (N,N-dimethylformamide), liquid paraffin, light liquid paraffin, silicone, dimethylacetamide, and N-methylpyrrolidone or 2,2-dimethyl-4-oxy-methylene-1,3-dioxolane.

[0149] Examples of the absorption promoter include DMSO (dimethyl sulfoxide), isopropyl myristate, dipropylene glycol pelargonate, silicone oil, aliphatic esters, triglycerides, and fatty alcohols.

[0150] Examples of the antioxidant include sulfurous acid salts, metabisulfurous acid salts, ascorbic acid, butylhy-

droxytoluene, butylhydroxyanisole, and tocopherol.

[0151] An emulsion can be administered through oral administration, transdermal administration, or injection. An emulsion can be prepared by dissolving active ingredients in a hydrophobic phase or hydrophilic phase, and homogenizing the resultant with a solvent of another phase by using a proper emulsifying agent with further addition of an auxiliary agent such as a coloring agent, an absorption promoter, a protectant, an antioxidant, a shading agent, and a thickening substance, if necessary.

[0152] Examples of the hydrophobic phase (oil) include paraffin oil, silicone oil, sesame oil, almond oil, castor oil, synthetic triglyceride, ethyl stearate, di-n-butyl adipate, hexyl laurate, dipropylene glycol pelargonate, esters of branched short-chain fatty acid and saturated fatty acid having a chain length of C16 to C18, isopropyl myristate, isopropyl palmitate, caprylates/caprates of saturated aliphatic alcohol having a chain length of C12 to C18, isopropyl stearate, oleyl oleate, decyl oleate, ethyl oleate, ethyl lactate, wax-like fatty acid esters, dibutyl phthalate, diisopropyl adipate, isotridecyl alcohol, 2-octyldodecanol, cetylstearyl alcohol, and oleyl alcohol.

[0153] Examples of the hydrophilic phase include water, propylene glycol, glycerin, and sorbitol.

[0154] Examples of the emulsifying agent include nonionic surfactants such as polyoxyethylated castor oil, polyoxyethylated sorbitan monoolefinates, sorbitan monostearate, glycerin monostearate, polyoxyethyl stearate, and alkylphenol polyglycol ether; amphoteric surfactants such as disodium N-lauryl-β-iminodipropionate and lecithin; anionic surfactants such as sodium laurylsulfate, fatty alcohol sulfuric ether, and monoethanolamine salts of mono/dialkyl polyglycol orthophosphate; and cationic surfactants such as cetyltrimethylammonium chloride.

[0155] Examples of other auxiliary agents include carboxymethylcellulose, methylcellulose, polyacrylate, arginate, gelatin, gum arabic, polyvinylpyrrolidone, polyvinyl alcohol, methyl vinyl ether, copolymers with maleic anhydride, polyethylene glycol, waxes, and colloidal silica.

[0156] A semi-solid preparation can be administered by applying to or spreading on skin, or by introducing into a body cavity. A gel can be prepared by adding a sufficient amount of a thickener for generating a transparent substance having ointment-like viscosity to a solution prepared as described above for the solution or emulsion for injection.

[0157] Next, formulation examples with the presently invented compound are shown. However, blend examples of formulations containing the presently invented compound are not limited thereto. In the following blend examples, the word "part" means part by mass.

[Wettable powder]

[0158]

Presently invented compound: 0.1 to 80 parts

Solid carrier: 5 to 98.9 parts

Surfactant: 1 to 10 parts

Others: 0 to 5 parts

[0159] Examples of "Others" include an anticaking agent and an antidegradant.

[Emulsion]

[0160]

Presently invented compound: 0.1 to 30 parts

Liquid carrier: 45 to 95 parts

Surfactant: 4.9 to 15 parts

Others: 0 to 10 parts

[0161] Examples of "Others" include a spreader and an antidegradant.

[Suspension]

[0162]

Presently invented compound: 0.1 to 70 parts

Liquid carrier: 15 to 98.89 parts

Surfactant: 1 to 12 parts

Others: 0.01 to 30 parts

[0163] Examples of "Others" include an antifreezing agent and a thickening agent.

[Granular wettable powder]

[0164]

Presently invented compound: 0.1 to 90 parts

Solid carrier: 0 to 98.9 parts

Surfactant: 1 to 20 parts

Others: 0 to 10 parts

[0165] Examples of "Others" include a binder and an antidegradant.

[Solution or emulsion]

[0166]

Presently invented compound: 0.01 to 70 parts

Liquid carrier: 20 to 99.99 parts

Others: 0 to 10 parts

[0167] Examples of "Others" include an antifreezing agent and a spreader.

[Granule]

[0168]

Presently invented compound: 0.01 to 80 parts

Solid carrier: 10 to 99.99 parts

Others: 0 to 10 parts

[0169] Examples of "Others" include a binder and an antidegradant.

[Powder]

[0170]

Presently invented compound: 0.01 to 30 parts

Solid carrier: 65 to 99.99 parts

Others: 0 to 5 parts

[0171] Examples of "Others" include an anti-drift agent and an antidegradant.

[0172] Next, formulation examples with the presently invented compound as an active ingredient are specifically shown, but the present invention is not limited thereto. Presently invented compound No. 1-001 shown in the following refers to N-(4-fluorophenyl)-6-[3-(6-fluoropyridin-3-yl)-4-(trifluoromethyl)phenyl]-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide shown later in Synthesis Example 1.

[Blend Example 1] Wettable powder

[0173]

Presently invented compound No. 1-001: 20 parts

Pyrophyllite: 74 parts

SORPOL 5039: 4 parts

(product name, TOHO Chemical Industry Co., Ltd., mixture of nonionic surfactant and anionic surfactant)

CARPLEX #80D: 2 parts

(product name, Shionogi & Co., Ltd., synthetic hydrated silicate)

[0174] These are homogenously mixed and pulverized to give a wettable powder.

[Blend Example 2] Emulsion

5 **[0175]**

Presently invented compound No. 1-001: 5 parts

Xylene: 75 parts

N-Methylpyrrolidone: 15 parts

10 SORPOL 2680: 5 parts

(product name, TOHO Chemical Industry Co., Ltd., mixture of nonionic surfactant and anionic surfactant)

[0176] These are homogenously mixed to give an emulsion.

15 [Blend Example 3] Suspension

[0177]

Presently invented compound No. 1-001: 25 parts

20 AGRISOL S-710: 10 parts

(product name, Kao Corporation, nonionic surfactant)

RUNOX 1000C: 0.5 parts

(product name, TOHO Chemical Industry Co., Ltd., anionic surfactant)

Xanthan gum: 0.2 parts

25 Water: 64.3 parts

[0178] These are homogenously mixed, and then wet-pulverized to give a suspension.

[Blend Example 4] Granular wettable powder

30

[0179]

Presently invented compound No. 1-001: 75 parts

HITENOL NE-15: 5 parts

35 (Product name, DKS Co. Ltd., anionic surfactant)

VANILLEX N: 10 parts

(product name, Nippon Paper Industries Co., Ltd., anionic surfactant)

CARPLEX #80D: 10 parts

(product name, Shionogi & Co., Ltd., synthetic hydrated silicate)

40

[0180] These are homogenously mixed and pulverized, a small amount of water is then added, the mixture is stirred and mixed and granulated with an extrusion granulator, and the resultant is dried to give a granular wettable powder.

[Blend Example 5] Granule

45

[0181]

Presently invented compound No. 1-001: 5 parts

Bentonite: 50 parts

50 Talc: 45 parts

[0182] These are homogenously mixed and pulverized, a small amount of water is then added, the mixture is stirred and mixed and granulated with an extrusion granulator, and the resultant is dried to give a granule.

55 [Blend Example 6] Powder

[0183]

Presently invented compound No. 1-001: 3 parts
 CARPLEX #80D: 0.5 parts
 (product name, Shionogi & Co., Ltd., synthetic hydrated silicate)
 Kaolinite: 95 parts
 Diisopropyl phosphate: 1.5 parts

[0184] These are homogeneously mixed and pulverized to give a powder.

[0185] In use, the formulation is sprinkled after 1- to 10000-fold dilution with water, or directly sprinkled without dilution.

[Blend Example 7] Wettable powder preparation

[0186]

Presently invented compound No. 1-001: 25 parts
 Sodium diisobutyl naphthalenesulfonate: 1 part
 Calcium n-dodecylbenzenesulfonate: 10 parts
 Alkylaryl poly glycol ether: 12 parts
 Sodium salt of naphthalenesulfonic acid-formalin condensate: 3 parts
 Emulsion-type silicone: 1 part
 Silicon dioxide: 3 parts
 Kaolin: 45 parts

[Blend Example 8] Water-soluble thick agent preparation

[0187]

Presently invented compound No. 1-001: 20 parts
 Polyoxyethylene lauryl ether: 3 parts
 Sodium dioctylsulfosuccinate: 3.5 parts
 Dimethyl sulfoxide: 37 parts
 2-Propanol: 36.5 parts

[Blend Example 9] Solution or emulsion for spraying

[0188]

Presently invented compound No. 1-001: 2 parts
 Dimethyl sulfoxide: 10 parts
 2-Propanol: 35 parts
 Acetone: 53 parts

[Blend Example 10] Solution or emulsion for transdermal administration

[0189]

Presently invented compound No. 1-001: 5 parts
 Hexylene glycol: 50 parts
 2-Propanol: 45 parts

[Blend Example 11] Solution or emulsion for transdermal administration

[0190]

Presently invented compound No. 1-001: 5 parts
 Propylene glycol monomethyl ether: 50 parts
 Dipropylene glycol: 45 parts

[Blend Example 12] Solution or emulsion for transdermal administration (pour-on)

[0191]

- 5 Presently invented compound No. 1-001: 2 parts
Light liquid paraffin: 98 parts

[Blend Example 13] Solution or emulsion for transdermal administration (pour-on)

10 **[0192]**

- Presently invented compound No. 1-001: 2 parts
Light liquid paraffin: 58 parts
Olive oil: 30 parts
15 O.D.O: 9 parts
(product name, The Nisshin Oil Co. Group, Ltd., medium-chain fatty acid oil)
Shin-Etsu Silicone: 1 part

[0193] In using as an agrochemical or a veterinary drug, the presently invented compound may be mixed with a chemical of other type in formulation or application, as necessary. Application of a mixture is expected to result in cost reduction due to reduction in the amount of application, and extension of the control spectrum and higher pesticidal effect due to the synergistic action of the mixed chemical. In this case, it is even possible to combine with multiple known chemicals at the same time.

[0194] Examples of the type of agrochemical to be mixed with the presently invented compound for use include compounds described in The Pesticide Manual, 18th ed., 2018 and The Pesticide Manual, 19th ed., 2021. Examples of the specific common names of the compounds, together with antiparasitic drugs and antibiotics to be mixed for use as a veterinary drug, are as follow, but not necessarily limited thereto.

[0195] Insecticides: abamectin, acephate, acequinocyl, acetamiprid, acrinathrin, acynonapyr, afidopyropen, afoxolaner, alanycarb, aldicarb, allethrin, alpha-cypermethrin, alpha-endosulfan, amidoflumet, amitraz, azamethiphos, azinphos-ethyl, azinphos-methyl, azocyclotin, *Bacillus thuringiensis*, bendiocarb, benfluthrin, benfuracarb, bensultap, benzoximate, benzpyrimoxan, beta-cyfluthrin, beta-cypermethrin, bifentazate, bifenthrin, bioallethrin, bioresmethrin, bistrifluron, broflanilide, bromopropylate, buprofezin, butocarboxim, carbaryl, carbofuran, carbosulfan, cartap, chinomethionat, chlorantraniliprole, chlorethoxyfos, chlorfenapyr, chlorfenvinphos, chlorfluazuron, chlormephos, chlorobenzilate, chloroprallethrin, chlorpyrifos, chlorpyrifos-methyl, chromafenozide, clofentezine, clothianidin, cyanophos, cyantraniliprole, cyclaniliprole, cycloprothrin, cyenopyrafen, cyetpyrafen, cyflumetofen, cyfluthrin, cyhalodiamide, cyhalothrin, cyhexatin, cypermethrin, cyphenothrin, cyproflumethrin, cyromazine, deltamethrin, diacloden, diafenthiuron, diazinon, dichlorvos, dicloromezotiaz, dicofol, dienochlor, diflovidazin, diflubenzuron, dimefluthrin, dimethoate, dimethylvinphos, dimpropridaz, dinotefuran, diofenolan, disulfoton, DNOC, d-T-80-phthalthrin (d-tetramethrin), emamectin-benzoate, empenethrin, endosulfan, EPN, epsilon-metofluthrin, epsilon-momfluorothrin, esfenvalerate, ethiofencarb, ethiprole, etofenprox, etoxazole, etrimfos, Febantel, fenazaquin, fenbutatin oxide, fenitrothion, fenmezoditiaz, fenobucarb, fenothiocarb, fenoxycarb, fenpropathrin, fenpyroximate, fenthion, fenvalerate, fipronil, flometoquin, flonicamid, fluacrypyrim, fluazuron, flubendiamide, fluchloridiliprole, flucycloxuron, flucythrinate, flufenimer, flufenoxuron, flufenprox, flufiprole, fluhexafon, flumethrin, flupentiofenox, flupyradifurone, flupyrimin, flupyroxystrobin, fluralaner, fluvalinate, fluxametamide, fonophos, formetanate, formothion, furathiocarb, gamma-cyhalothrin, halfenprox, halofenozide, heptafluthrin, hexaflumuron, hexythiazox, hydramethylnon, imidacloprid, imiprothrin, indazaproxamet, indoxacarb, indoxacarb-MP, isocycloseram, isofenphos, isoprocarb, isoxathion, kappa-bifenthrin, kappa-tefluthrin, lambda-cyhalothrin, ledprona, lepimectin, lufenuron, malathion, meperfluthrin, metaflumizone, metalcarb, metaldehyde, methacryfos, methamidophos, methidathion, methomyl, methoprene, methoxychlor, methoxyfenozide, methyl bromide, metofluthrin, milbemectin, momfluorothrin, monocrotophos, muscalure, nicofluprole, nitenpyram, novaluron, noviflumuron, omethoate, oxazosulfyl, oxydemeton-methyl, oxydeprofos, parathion, parathion-methyl, pentachlorophenol, permethrin, phenothrin, phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimicarb, pirimiphos-methyl, praziquantel, profenofos, profluthrin, propaphos, propargite, prothiofos, prothifenbutate, pyflubumide, pymetrozine, pyraclofos, pyrafluprole, pyrethrins, pyridaben, pyridalyl, pyrifluquinazon, pyrimidifen, pyriprole, pyriproxifen, resmethrin, rotenone, silafluofen, spidoxamat, spinetoram, spinosad, spirotetramet, spirotetramet, spiromesifen, spiropidion, spirotetramet, spiromesifen, sulflufumin, sulfotep, sulfoxaflor, sulprofos, tau-fluvalinate, tebufenpyrad, teflubenzuron, tefluthrin, terbufos, tetrachlorantraniliprole, tetrachlorvinphos, tetramethrin, tetramethylfluthrin, tetraniliprole, thiacloprid, thiamethoxam, thiocyclam, thiodicarb, thiofanox, thiometon, tiorantraniliprole, tolfenpyrad, talomethrin, transfluthrin, triazamate, triazuron, trichlorfon, triflumezopyrim, triflumuron, tyclopyrazoflor, vamidothion, and zeta-cypermethrin, and so on.

[0196] Microbicides: acibenzolar-S-methyl, acypetacs, aldimorph, allyl alcohol, ametoctradin, aminopyrifin, amisulbrom, amobam, ampropylfos, anilazine, azaconazole, azithiram, azoxystrobin, barium polysulfide, benalaxyl, benalaxyl-M, benodanil, benomyl, benquinox, bentazon, benthialdicarb-isopropyl, benthiazole, benzamacril, benzamorf, ben-zovindiflupyr, binapacryl, biphenyl, bitertanol, bixafen, blasticidin-S, bordeaux mixture, boscalid, bromuconazole, bupirimate, buthiobate, butylamine, calcium polysulfide, captafol, captan, carbamorph, carbendazim, carboxin, carpropamid, carvone, cheshunt mixture, chinomethionat, chlobenthiazole, chloranilformethane, chloranil, chlorfenazole, chloroneb, chloroinconazole, chloropicrin, chlorothalonil, chlorquinox, chlozolate, climbazole, copper acetate, copper carbonate basic, copper hydroxide, copper naphthenate, copper oleate, basic copper chloride (copper oxychloride), copper sulfate, basic copper sulfate, copper zinc chromate, coumoxystrobin, cresol, cufraneb, cuproban, cyazofamid, cyclafuramid, cycloheximide, cyflufenamid, cymoxanil, cypendazole, cyproconazole, cyprodinil, cyprofuram, dazomet, debacarb, decafenit, dehydroacetic acid, dichlobentiazox, dichlofluanid, dichlone, dichlorophen, dichlozoline, diclobutrazol, diclo-cymet, diclomezine, dicloran, diethofencarb, difenoconazole, diflometorim, dimethirimol, dimethomorph, dimoxystrobin, diniconazole, diniconazole-M, dinobuton, dinocap, dinocap-4, dinocap-6, dinocron, dinosulfon, dinoterbon, diphenyla-mine, dipymetitrone, dipyrithione, disulfiram, ditalimfos, dithianon, DNOC, dodemorph, dodine, drazoxolon, edifenphos, enestrobin, enoxastrobin, epoxiconazole, ethaboxam, etaconazole, etem, ethirimol, ethoxyquin, etridiazole, famoxa-done, fenamidone, fenaminosulf, fenaminostrobin, fenapanil, fenarimol, fenbuconazole, fenfuram, fenhexamid, fenitropan, fenoxanil, fenciclonil, fencicloxamid, fenpropidin, fenpropimorph, fenpyrazamine, fentin, ferbam, ferimzone, florylpicox-amid, fluazinam, flubeneteram, fludioxonil, flufenoxadiazam, flufenoxystrobin, fluindapyr, flumetilsulfurim, flumetover, flumorph, fluopicolide, flupirimomide, fluopyram, fluoroimidazole, fluoxapiprolin, fluoxastrobin, fluoxytiocona-zole, fluquinconazole, flusilazole, flusulfamid, flutolanil, flutianil, flutriafol, fluxapyroxad, folpet, fosetyl-aluminium, fthalide, fuberidazole, furalaxyl, furametpyr, furcarbanil, furconazole, furconazole-cis, furmecycloz, furophanate, glyodin, griseofulvin, guazatine, halacrinat, hexachlorobenzene, hexaconazole, hexylthiofos, 8-hydroxyquinoline sulfate, hy-mexazol, imazalil, imibenconazole, iminoctadine-albesilate, iminoctadine-triacetate, ipnyrfluxam, iodocarb, ipconazole, ipfentrifluconazole, ipflufenquin, iprobenfos, iprodione, iprovalicarb, isofetamid, isoflucypram, isotianil, isoprothiolane, isopyrazam, isovaldione, kasugamycin, kresoxim-methyl, laminarin, mancopper, mancozeb, mandestrobin, mandipro-pamid, maneb, mebenil, mecarbinzid, mefentrifluconazole, mepanipyrin, mepronil, meptyldinocap, metalaxyl, metalaxyl-M, metam, metarylpicoxamid, metazoxolon, metconazole, methasulfocarb, methfuroxam, metyltetraprole, metiram, metominostrobin, metrafenone, metsulfosax, milneb, myclobutanil, myclozolin, nabam, naftifine, natamycin, organonick-el (nickel bis(dimethyldithiocarbamate)), nitrostyrene, nitrothal-isopropyl, nuarimol, octhilinone, ofurace, orysastrobin, oxadixyl, oxathiapiprolin, oxyquinoline copper (oxine copper), oxpoconazole fumarate, oxycarboxin, pefurazoate, pen-conazole, pencycuron, penflufen, pentachlorophenol, penthiopyrad, 2-phenylphenol, phosdiphen, phthalide, picarbu-trazox, picoxystrobin, piperalin, polycarbamate, polyoxins, polyoxorim, potassium azide, potassium hydrogen carbonate, probenazole, prochloraz, procymidone, propamocarb hydrochloride, propiconazole, propineb, proquinazid, prothiocarb, pyrazophos, pyribencarb, pyrifenoxy, pyrimethanil, pyriminostrobin, pyroquilon, prothiocarb, prothioconazole, pydiflume-tofen, pyracarbolid, pyraclostrobin, pyrametostrobin, pyraoxystrobin, pyrapropoyne, pyraziflumid, pyridachlometyl, pyr-idinitril, pyriofenone, pyrisoxazole, pyroxychlor, pyroxyfur, quinacetol-sulfate, quinazamid, quinconazole, quinoxifen, quinofumelin, quintozone, rabenzazole, salicylanilide, seboctylamine, sedaxane, silthiofam, simeconazole, sodium hydrogen carbonate, sodium hypochlorite, spiroxamine, sulfur, tebuconazole, tebufloquin, tecloftalam, tecnazene, tecoram, tetraconazole, thiabendazole, thiadiflur, thicyofen, thifluzamide, thiochlorfenphim, thiophanate, thiopha-nate-methyl, thiram, tiadinil, tioxyimid, tolclofos-methyl, tolprocarb, tolylfluanid, triadimefon, triadimenol, triamiphos, triarimol, triazbutil, triazoxide, tributyltin oxide, trichlamine, triclopyricarb, tricyclazole, tridemorph, trifloxystrobin, triflu-mizole, triforine, triticonazole, validamycin, valifenalate, vinclozolin, zarilamid, zinc naphthenate, zinc sulfate, zineb, ziram, zoxamide, shiitake mycelium extract, and shiitake fruiting body extract, and so on.

[0197] Nematicides: aldoxycarb, benclotiaz, cadusafos, cyclobutylfluram, DBCP, dichlofenthion, DSP, ethoprophos, fenamiphos, fensulfthion, fluzaindolizine, fluensulfone, fosthiazate, fosthietan, imicyafos, isamidofos, isazofos, ox-amyli, thionazin, tioazafen, and trifluenfurate, and so on.

[0198] Drugs for parasites: esfenvalerate, fenprothrin, fenvalerate, cypermethrin, bifenthrin, cypermethrin, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, tefluthrin, zeta-cypermethrin, acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyr, thiamethoxam, chromafenozide, fenoxycarb, lufenuron, methoprene, pyriproxyfen, triflumuron, chlorpyrifos, chlorpyrifos-methyl, diazinon, dichlorvos, fenitrothion, fenthion, malathion, pirimiphos-methyl, tetrachlorvin-phos, ethiprole, fipronil, propoxur, carbaryl, bendiocarb, metoxadiazole, fenobucarb, carbofuran, afoxolaner, fluralaner, fluxametamide, sarolaner, lotilaner, tigolaner, esafloxolaner, moxifloxacin, umifloxacin, mivofloxacin, ivermectin, doramectin, eprinomectin, maduramycin, milbemycin, milbemycin oxime, moxidectin, selamectin, indoxacarb, amitraz, bistrifluron, spinosad, albendazole, atovaquone, bithionol, cambendazole, carnidazole, chloroquine, clazuril, clorsulon, closantel, coumaphos, dichlorophen, diethylcarbamazine, diminazene, dinitolmide, dithiazanine iodide, emo-depside, epsiprantel, febantel, fenbendazole, flubendazole, glycalpyramide, imidocarb, levamisole, mebendazole, mebendazole, mefloquine hydrochloride, melarsamine hydrochloride, metronidazole, metyridine, monepantel, morantel tartrate, niclosamide, oxfentel pamoate, oxfentel tartrate, oxbendazole, oxclozanide, piperazine adipate, piperazine

citrate, piperazine phosphate, praziquantel, pyrantel pamoate, rafoxanide, tetramisole hydrochloride, thiabendazole, and triclabendazole, and so on.

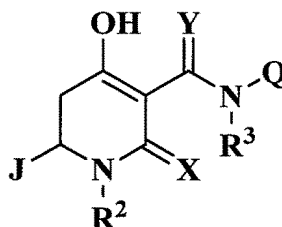
[0199] Antibiotics: amoxicillin, ampicillin, cefapirin, cefazolin sodium, cefquinome, ceftiofur, penicillin, chlortetracycline, oxytetracycline, danofloxacin, difloxacin, oxolinic acid, enrofloxacin, florfenicol, lincomycin, lomefloxacin, marbofloxacin, miloxacin, mirosamycin, norfloxacin, ofloxacin, orbifloxacin, valnemulin, thiamphenicol, tiamulin fumarate, tilmicosin phosphate, acetylisovaleryltylosin, tylosin phosphate, tulathromycin, ketoconazole, miconazole nitrate, and clavulanic acid, and so on.

[0200] The presently invented compound has superior insecticidal and acaricidal activity against many noxious insects in agriculture, spider mites, and internal or external parasites in mammals or birds, and also exerts sufficient control effect against noxious insects that have acquired resistance to existing insecticides. In addition, the presently invented compound causes almost no adverse effect on mammals, fishes, and beneficial insects, and has low persistence with light environmental loads. Accordingly, the present invention can provide novel useful pesticides.

[0201] Based on the preceding description, embodiments of the present invention relates to [1] to [83] in the following.

[1] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 22]

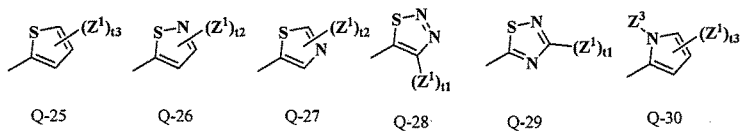
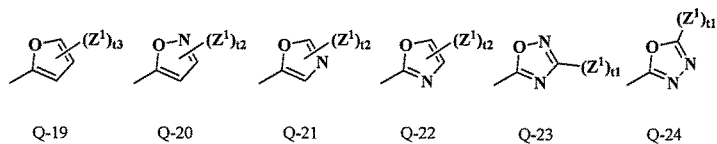
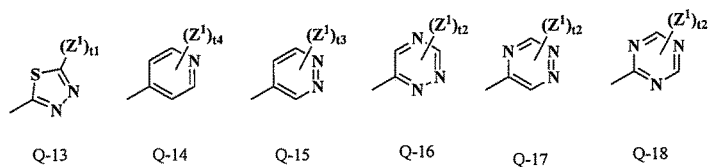
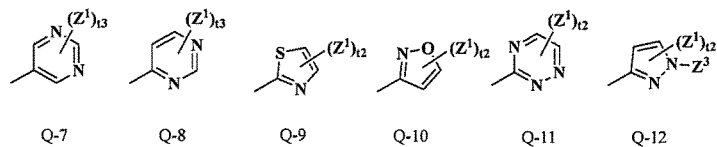
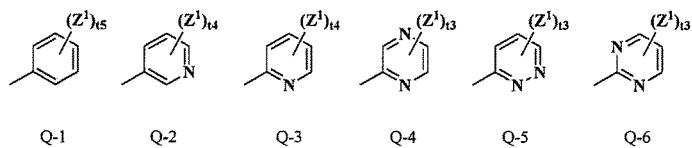


(1)

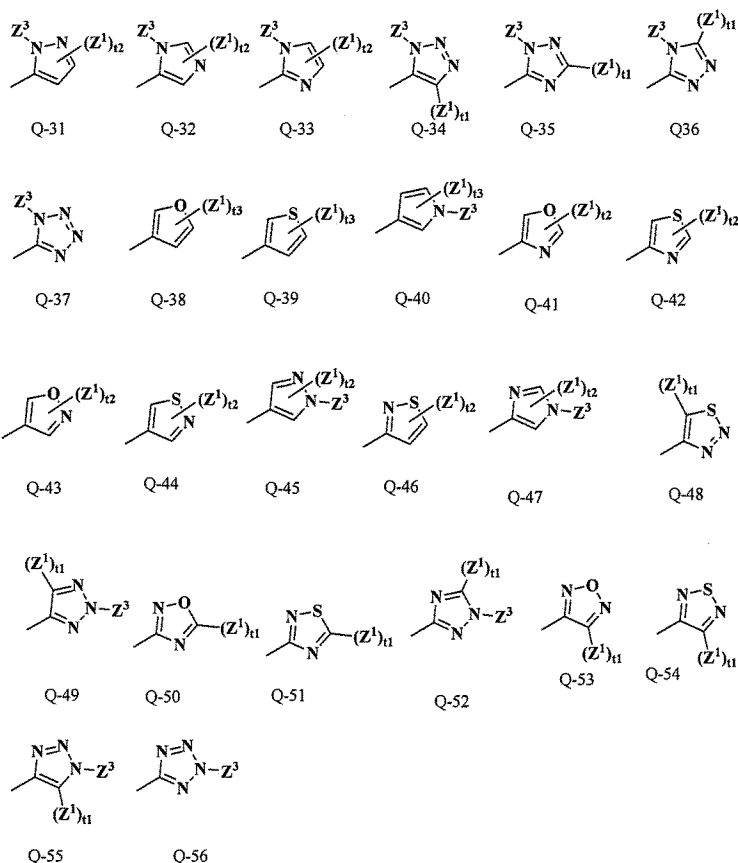
wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-16, Q-17, Q-18, Q-19, Q-20, Q-21, Q-22, Q-23, Q-24, Q-25, Q-26, Q-27, Q-28, Q-29, Q-30, Q-31, Q-32, Q-33, Q-34, Q-35, Q-36, Q-37, Q-38, Q-39, Q-40, Q-41, Q-42, Q-43, Q-44, Q-45, Q-46, Q-47, Q-48, Q-49, Q-50, Q-51, Q-52, Q-53, Q-54, Q-55 or Q-56,

[Formula 23]



[Formula 24]



Z^1 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, halo (C_1 - C_6) alkyl, halo (C_2 - C_6) alkenyl, halo (C_2 - C_6) alkynyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_2 - C_6 alkoxy (C_1 - C_6) alkoxy, C_2 - C_6 alkenyloxy, halo (C_2 - C_6) alkenyloxy, C_2 - C_6 alkynyloxy, halo (C_2 - C_6) alkynyloxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, halo (C_1 - C_6) alkylthio, halo (C_1 - C_6) alkylsulfinyl, halo (C_1 - C_6) alkylsulfonyl, C_2 - C_6 alkenylthio, C_2 - C_6 alkenylsulfinyl, C_2 - C_6 alkenylsulfonyl, halo (C_2 - C_6) alkenylthio, halo (C_2 - C_6) alkenylsulfinyl, halo (C_2 - C_6) alkenylsulfonyl, C_2 - C_6 alkynylthio, C_2 - C_6 alkynylsulfinyl, C_2 - C_6 alkynylsulfonyl, halo (C_2 - C_6) alkynylthio, halo (C_2 - C_6) alkynylsulfinyl, halo (C_2 - C_6) alkynylsulfonyl, $-NH_2$, C_1 - C_6 alkylamino, di (C_1 - C_6) alkylamino, halo (C_1 - C_6) alkylamino, dihalo (C_1 - C_6) alkylamino, formyl, carboxy, C_1 - C_6 alkylcarbonyl, halo (C_1 - C_6) alkylcarbonyl, C_1 - C_6 alkoxy carbonyl, halo (C_1 - C_6) alkoxy carbonyl, C_1 - C_6 alkylaminocarbonyl, halo (C_1 - C_6) alkylaminocarbonyl, di (C_1 - C_6) alkylaminocarbonyl, hydroxy, C_1 - C_6 alkylcarbonyloxy, C_1 - C_6 alkoxy carbonyloxy, C_1 - C_6 alkylsulfonyloxy, halo (C_1 - C_6) alkylsulfonyloxy, $-SO_3H$, C_1 - C_6 alkylaminosulfonyl, di (C_1 - C_6) alkylaminosulfonyl, $-C(=NOR^{12})R^{13}$, cyano or nitro,

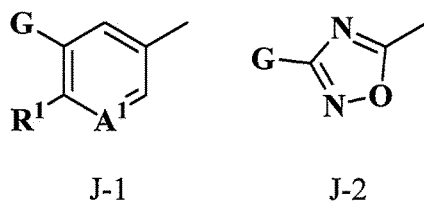
R^{12} represents a hydrogen atom or C_1 - C_6 alkyl,

R^{13} represents a hydrogen atom or C_1 - C_6 alkyl,

Z^3 represents a hydrogen atom or C_1 - C_6 alkyl,

J represents J-1 or J-2,

[Formula 25]



A^1 represents a nitrogen atom or CH,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-36,

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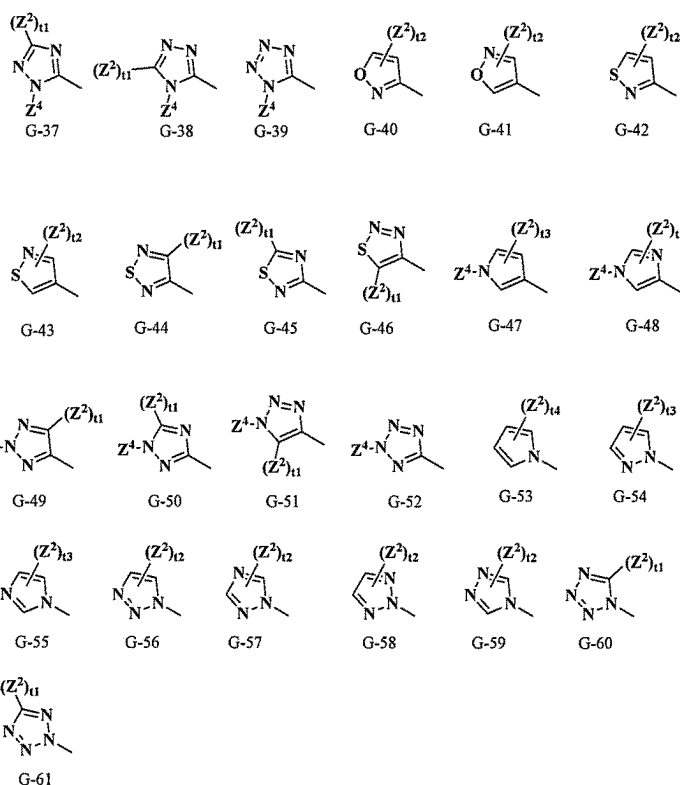
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[Formula 27]



Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, halo (C_1 - C_6) alkyl, halo (C_2 - C_6) alkenyl, halo (C_2 - C_6) alkynyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkoxy (C_1 - C_6) alkoxy, C_2 - C_6 alkenyloxy, halo (C_2 - C_6) alkenyloxy, C_2 - C_6 alkynyloxy, halo (C_2 - C_6) alkynyloxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, halo (C_1 - C_6) alkylthio, halo (C_1 - C_6) alkylsulfinyl, halo (C_1 - C_6) alkylsulfonyl, C_2 - C_6 alkenylthio, C_2 - C_6 alkenylsulfinyl, C_2 - C_6 alkenylsulfonyl, halo (C_2 - C_6) alkenylthio, halo (C_2 - C_6) alkenylsulfinyl, halo (C_2 - C_6) alkenylsulfonyl, C_2 - C_6 alkynylthio, C_2 - C_6 alkynylsulfinyl, C_2 - C_6 alkynylsulfonyl, halo (C_2 - C_6) alkynylthio, halo (C_2 - C_6) alkynylsulfinyl, halo (C_2 - C_6) alkynylsulfonyl, $-NH_2$, C_1 - C_6 alkylamino, di (C_1 - C_6) alkylamino, halo (C_1 - C_6) alkylamino, dihalo (C_1 - C_6) alkylamino, formyl, carboxy, C_1 - C_6 alkylcarbonyl, halo (C_1 - C_6) alkylcarbonyl, C_1 - C_6 alkoxy carbonyl, halo (C_1 - C_6) alkoxy carbonyl, C_1 - C_6 alkylaminocarbonyl, halo (C_1 - C_6) alkylaminocarbonyl, di (C_1 - C_6) alkylaminocarbonyl, hydroxy, C_1 - C_6 alkylcarbonyloxy, C_1 - C_6 alkoxy carbonyloxy, C_1 - C_6 alkylsulfonyloxy, halo (C_1 - C_6) alkylsulfonyloxy, $-SO_3H$, C_1 - C_6 alkylaminosulfonyl, di (C_1 - C_6) alkylaminosulfonyl, $-C(=NOR^{14})R^{15}$, nitro or cyano,

R^{14} represents a hydrogen atom or C_1 - C_6 alkyl,

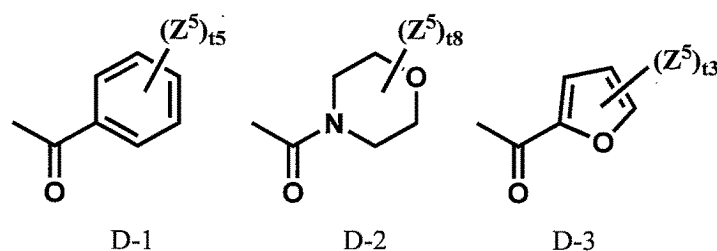
R^{15} represents a hydrogen atom or C_1 - C_6 alkyl,

Z^4 represents C_1 - C_6 alkyl,

R^1 represents a hydrogen atom, a halogen atom, halo (C_1 - C_6) alkyl, C_1 - C_6 alkyl or cyano,

R^2 represents a hydrogen atom, C_1 - C_6 alkyl, halo (C_1 - C_6) alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_6 cycloalkyl, $-C(O)R^4$, $-C(O)OR^5$, D-1, D-2 or D-3,

[Formula 28]



R⁴ represents C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, C₁-C₆ alkylcarbonyl, di (C₁-C₆) alkylamino or (C₁-C₆) alkyl substituted with R⁶,

R⁶ represents a halogen atom, C₁-C₆ alkoxy, cyano, nitro, phenyl or phenyl substituted with R⁸,

Z⁵ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R⁸ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R⁵ represents C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, (C₁-C₆) alkyl substituted with R⁹, phenyl or phenyl substituted with R¹⁰,

R⁹ represents a halogen atom, C₁-C₆ alkoxy, cyano, nitro, phenyl or phenyl substituted with R¹¹,

R¹⁰ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R¹¹ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,

R³ represents a hydrogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl or C₁-C₆ alkylcarbonyl,

X represents an oxygen atom or a sulfur atom,

Y represents an oxygen atom or a sulfur atom,

t₁ represents an integer of 0 or 1,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4,

t₅ represents an integer of 0, 1, 2, 3, 4 or 5, and

t₈ represents an integer of 0, 1, 2, 3 or 4.

[2] The aryltetrahydropyridine compound according to [1] or a salt thereof, wherein

A¹ represents a nitrogen atom.

[3] The aryltetrahydropyridine compound according to any one of [1] to [2] or a salt thereof, wherein

Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆) alkylamino, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, hydroxy, C₁-C₆ alkylcarbonyloxy, C₁-C₆ alkylsulfonyloxy, cyano or nitro,

Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, halo (C₂-C₆) alkenyl, halo (C₂-C₆) alkynyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆) alkylamino, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, hydroxy, C₁-C₆ alkylcarbonyloxy, C₁-C₆ alkylsulfonyloxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

Z⁵ represents a halogen atom, C₁-C₆ alkyl or C₁-C₆ alkoxy,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R² represents a hydrogen atom, -C(O)R⁴, -C(O)OR⁵, D-1, D-2 or D-3,

R³ represents a hydrogen atom,

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-16, Q-17, Q-18, Q-19, Q-20, Q-21, Q-22, Q-23, Q-25, Q-26, Q-27, Q-29, Q-30, Q-31, Q-32, Q-33, Q-38, Q-39, Q-40, Q-41, Q-42, Q-43, Q-44, Q-45, Q-46, Q-47, Q-50, Q-51, Q-52 or Q-54, and

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-37, G-38, G-40, G-41, G-42, G-43, G-45, G-47, G-48, G-50, G-53, G-54, G-55 or G-57.

[4] The aryltetrahydropyridine compound according to any one of [1] to [3] or a salt thereof, wherein

J represents J-1, and

A¹ represents a nitrogen atom.

[5] The aryltetrahydropyridine compound according to any one of [1] to [3] or a salt thereof, wherein

J represents J-2.

[6] The aryltetrahydropyridine compound according to any one of [1] to [5] or a salt thereof, wherein

G represents G-1, G-3, G-4, G-5, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-34, G-35, G-37, G-38, G-40, G-41, G-42, G-43, G-45, G-47, G-48, G-50, G-53, G-55 or G-57.

[7] The aryltetrahydropyridine compound according to [1] or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29, Q-31, Q-45 or Q-52,

Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, hydroxy, cyano or nitro,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28 or G-40,

Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, di (C₁-C₆) alkylamino, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, hydroxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

R¹⁴ represents C₁-C₆ alkyl,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R² represents a hydrogen atom, -C(O)R⁴, -C(O)OR⁵, D-1, D-2 or D-3,

R⁴ represents C₁-C₆ alkyl, C₃-C₆ cycloalkyl, C₁-C₆ alkylcarbonyl or (C₁-C₆) alkyl substituted with R⁶,

R⁶ represents a halogen atom or C₁-C₆ alkoxy,

Z⁵ represents C₁-C₆ alkyl,

R⁵ represents C₁-C₆ alkyl or C₂-C₆ alkenyl,

R³ represents a hydrogen atom, and

X represents an oxygen atom.

[8] The aryltetrahydropyridine compound according to [7] or a salt thereof, wherein

G represents G-1, G-3, G-4, G-5, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28 or G-40.

[9] The aryltetrahydropyridine compound according to [8] or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29 or Q-45,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, C₁-C₆ alkoxycarbonyl, cyano or nitro,

Z³ represents C₁-C₆ alkyl, and

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, hydroxy, nitro or cyano.

[10] The aryltetrahydropyridine compound according to [9] or a salt thereof, wherein

J represents J-1,

A¹ represents a nitrogen atom,

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-12, Q-13, Q-14 or Q-22,

G represents G-1, G-3, G-4 or G-5,

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy or nitro,

R² represents a hydrogen atom or -C(O)OR⁵,

R⁵ represents C₁-C₆ alkyl, and

Y represents an oxygen atom.

[11] The aryltetrahydropyridine compound according to [10] or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, cyano or nitro,

G represents G-1 or G-3,

Z² represents a halogen atom, C₁-C₆ alkyl or halo (C₁-C₆) alkyl,

R¹ represents a halogen atom or halo (C₁-C₆) alkyl, and

R² represents a hydrogen atom.

[12] The aryltetrahydropyridine compound according to [11] or a salt thereof, wherein

J represents J-2,

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9, Q-10, Q-12, Q-20, Q-29 or Q-45,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, C₁-C₆ alkoxycarbonyl, cyano or nitro,

G represents G-1, G-3, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28

or G-40, and

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl or hydroxy.

[13] The aryltetrahydropyridine compound according to [12] or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, cyano or nitro, G represents G-1, G-3 or G-7,

Z² represents a halogen atom, C₁-C₆ alkyl or halo (C₁-C₆) alkyl, and

R² represents a hydrogen atom.

[14] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-11, Q-14, Q-15, Q-16, Q-17 or Q-18.

[15] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-11 or Q-14.

[16] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Q represents Q-1.

[17] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-14, Q-15, Q-16, Q-17 or Q-18.

[18] The aryltetrahydropyridine compound according to any one of [1] to [9] or a salt thereof, wherein Q represents Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8 or Q-14.

[19] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-9, Q-10, Q-12, Q-13, Q-19, Q-20, Q-21, Q-22, Q-23, Q-25, Q-26, Q-27, Q-29, Q-30, Q-31, Q-32, Q-33, Q-38, Q-39, Q-40, Q-41, Q-42, Q-43, Q-44, Q-45, Q-46, Q-47, Q-50, Q-51, Q-52 or Q-54.

[20] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-9, Q-12, Q-13, Q-20, Q-22, Q-31, Q-45 or Q-52.

[21] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-12, Q-30, Q-31, Q-32, Q-33, Q-40, Q-45, Q-47, Q-49, Q-52, Q-55 or Q-56.

[22] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-31, Q-45 or Q-52.

[23] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-9, Q-13, Q-25, Q-26, Q-27, Q-29, Q-39, Q-42, Q-44, Q-46, Q-51 or Q-54.

[24] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-9 or Q-13.

[25] The aryltetrahydropyridine compound according to any one of [1] to [6] or a salt thereof, wherein Q represents Q-10, Q-19, Q-20, Q-21, Q-22, Q-23, Q-38, Q-41, Q-43 or Q-50.

[26] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-10, Q-20 or Q-22.

[27] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9, Q-10 or Q-12.

[28] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12.

[29] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Q represents Q-1, Q-2, Q-3, Q-4 or Q-6.

[30] The aryltetrahydropyridine compound according to any one of [1] to [8] or a salt thereof, wherein Q represents Q-9, Q-10 or Q-12.

[31] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Q represents Q-9 or Q-12.

[32] The aryltetrahydropyridine compound according to any one of [1] to [2] and [14] to [31] or a salt thereof, wherein Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, halo (C₂-C₆) alkenyl, halo (C₂-C₆) alkynyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₂-C₆ alkoxy (C₁-C₆) alkoxy, C₂-C₆ alkenyloxy, halo (C₂-C₆) alkenyloxy, C₂-C₆ alkynyloxy, halo (C₂-C₆) alkynyloxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, C₂-C₆ alkenylthio, C₂-C₆ alkenylsulfinyl, C₂-C₆ alkenylsulfonyl, halo (C₂-C₆) alkenylthio, halo (C₂-C₆) alkenylsulfinyl, halo (C₂-C₆) alkenylsulfonyl, C₂-C₆ alkynylthio, C₂-C₆ alkynylsulfinyl, C₂-C₆ alkynylsulfonyl, halo (C₂-C₆) alkynylthio, halo (C₂-C₆) alkynylsulfinyl, halo (C₂-C₆) alkynylsulfonyl, cyano or nitro.

[33] The aryltetrahydropyridine compound according to any one of [1] to [2] and [14] to [31] or a salt thereof, wherein Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, -NH₂, C₁-C₆ alkylamino,

di (C₁-C₆) alkylamino, halo (C₁-C₆) alkylamino, dihalo (C₁-C₆) alkylamino, formyl, carboxy, C₁-C₆ alkylcarbonyl, halo (C₁-C₆) alkylcarbonyl, C₁-C₆ alkoxy carbonyl, halo (C₁-C₆) alkoxy carbonyl, C₁-C₆ alkylaminocarbonyl, halo (C₁-C₆) alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, cyano or nitro.

[34] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, cyano or nitro.

[35] The aryltetrahydropyridine compound according to any one of [1] to [13] or a salt thereof, wherein Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl or cyano.

[36] The aryltetrahydropyridine compound according to any one of [1] to [35] or a salt thereof, wherein Z³ represents C₁-C₆ alkyl.

[37] The aryltetrahydropyridine compound according to any one of [1] to [35] or a salt thereof, wherein Z³ represents a hydrogen atom.

[38] The aryltetrahydropyridine compound according to any one of [1] and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-36, G-37, G-38, G-39, G-40, G-41, G-42, G-43, G-44, G-45, G-46, G-47, G-48, G-49, G-50, G-51, G-52, G-53, G-54, G-55, G-56, G-57, G-58, G-59, G-60 or G-61.

[39] The aryltetrahydropyridine compound according to any one of [1] to [2] and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-5, G-6, G-7, G-8, G-11, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-32, G-33, G-34, G-35, G-36, G-37, G-38, G-39, G-47, G-48, G-49, G-50, G-51, G-52, G-53, G-54, G-55, G-56, G-57, G-58, G-59, G-60 or G-61.

[40] The aryltetrahydropyridine compound according to any one of [1] to [6] and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-5, G-7, G-11, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-32, G-34, G-35, G-36, G-37, G-38, G-47, G-48, G-50, G-53, G-55 or G-57.

[41] The aryltetrahydropyridine compound according to any one of [1] to [5], [7], and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-5, G-6, G-7, G-8, G-11, G-17 or G-19.

[42] The aryltetrahydropyridine compound according to any one of [1] to [9] and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-5, G-7, G-11, G-17 or G-19.

[43] The aryltetrahydropyridine compound according to any one of [1] to [9], [12], and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-7, G-11, G-17 or G-19.

[44] The aryltetrahydropyridine compound according to any one of [1] to [5] and [14] to [37] or a salt thereof, wherein G represents G-1, G-2, G-3, G-5, G-7, G-11, G-17, G-18, G-19, G-20, G-21, G-22, G-23 or G-24.

[45] The aryltetrahydropyridine compound according to any one of [1] to [7] and [14] to [37] or a salt thereof, wherein G represents G-1, G-2, G-3, G-5, G-7, G-11, G-17 or G-19.

[46] The aryltetrahydropyridine compound according to any one of [1] to [9] and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-5, G-7, G-11, G-17 or G-19.

[47] The aryltetrahydropyridine compound according to any one of [1] to [9], [12], and [14] to [37] or a salt thereof, wherein G represents G-1, G-3, G-7, G-11, G-17 or G-19.

[48] The aryltetrahydropyridine compound according to any one of [1] to [9], [12], and [14] to [37] or a salt thereof, wherein G represents G-1, G-3 or G-7.

[49] The aryltetrahydropyridine compound according to any one of [1] to [37] or a salt thereof, wherein G represents G-1 or G-3.

[50] The aryltetrahydropyridine compound according to any one of [1] to [49] or a salt thereof, wherein

t₁ represents an integer of 0,

t₂ represents an integer of 0,

t₃ represents an integer of 0 or 1,

t₄ represents an integer of 0, 1 or 2, and

t₅ represents an integer of 0 or 1.

[51] The aryltetrahydropyridine compound according to any one of [1] to [50] or a salt thereof, wherein

Q represents Q-2, Q-3, Q-4, Q-6, Q-9, Q-12 or Q-14,

Z¹ represents a halogen atom or C₁-C₆ alkyl,

Z³ represents C₁ alkyl,

J represents J-1 or J-2,
 A¹ represents a nitrogen atom,
 G represents G-1, G-3 or G-7,
 Z² represents a halogen atom,
 5 R¹ represents a halogen atom or halo (C₁-C₆) alkyl,
 R² represents a hydrogen atom,
 R³ represents a hydrogen atom,
 X represents an oxygen atom,
 Y represents an oxygen atom,
 10 t₂ represents an integer of 0, and
 t₄ represents an integer of 0, 1 or 2.

[52] The aryltetrahydropyridine compound according to any one of [1] to [50] or a salt thereof, wherein

15 Q represents Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,
 Z¹ represents a halogen atom or C₁-C₆ alkyl,
 Z³ represents C₁ alkyl,
 J represents J-1,
 A¹ represents a nitrogen atom,
 20 G represents G-1 or G-3,
 Z² represents a halogen atom,
 R¹ represents a halogen atom or halo (C₁-C₆) alkyl,
 R² represents a hydrogen atom,
 R³ represents a hydrogen atom,
 25 X represents an oxygen atom,
 Y represents an oxygen atom,
 t₂ represents an integer of 0, and
 t₄ represents an integer of 0, 1 or 2.

30 [53] The aryltetrahydropyridine compound according to any one of [1] to [51] or a salt thereof, wherein

Q represents Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,
 Z¹ represents a halogen atom or C₁-C₆ alkyl,
 Z³ represents C₁ alkyl,
 35 J represents J-2,
 G represents G-1 or G-3,
 Z² represents a halogen atom,
 R¹ represents a halogen atom or halo (C₁-C₆) alkyl,
 R² represents a hydrogen atom,
 40 R³ represents a hydrogen atom,
 X represents an oxygen atom,
 Y represents an oxygen atom,
 t₂ represents an integer of 0, and
 t₄ represents an integer of 0, 1 or 2.

45 [54] The aryltetrahydropyridine compound according to any one of [1] to [53] or a salt thereof, wherein

Q represents Q-2 or Q-3,
 G represents G-1 or G-3, and
 50 t₄ represents an integer of 0, 1 or 2.

[55] The aryltetrahydropyridine compound according to any one of [1] to [54] or a salt thereof, wherein
 R¹ represents a halogen atom or halo (C₁-C₆) alkyl.

55 [56] The aryltetrahydropyridine compound according to any one of [1] to [50] or a salt thereof, wherein

R² represents a hydrogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, -C(O)R⁴ or -C(O)OR⁵,
 R⁴ represents C₁-C₆ alkyl, and
 R⁵ represents C₁-C₆ alkyl.

[57] The aryltetrahydropyridine compound according to [56] or a salt thereof, wherein

R² represents a hydrogen atom or C₁-C₆ alkyl.

[58] The aryltetrahydropyridine compound according to [57] or a salt thereof, wherein

R² represents a hydrogen atom.

[59] The aryltetrahydropyridine compound according to any one of [1] to [58] or a salt thereof, wherein

R³ represents a hydrogen atom.

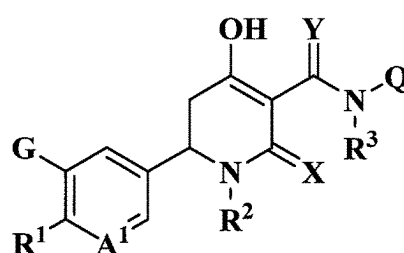
[60] The aryltetrahydropyridine compound according to any one of [1] to [59] or a salt thereof, wherein

X represents an oxygen atom, and

Y represents an oxygen atom.

[61] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 29]

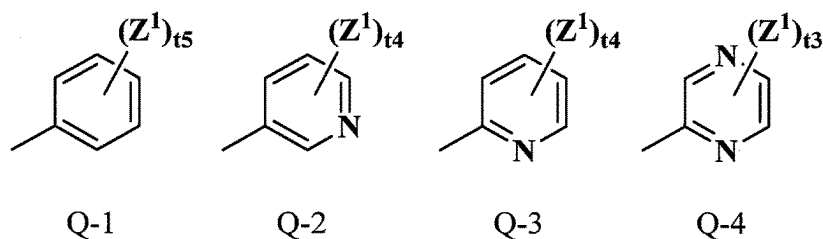


(1)

wherein

Q represents Q-1, Q-2, Q-3 or Q-4,

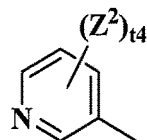
[Formula 30]



Z¹ represents a halogen atom, halo (C₁-C₆) alkyl or cyano,

G represents G-1,

[Formula 31]



G-1

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy or cyano,

R¹ represents a halogen atom or halo (C₁-C₆) alkyl,

R² represents a hydrogen atom,

R³ represents a hydrogen atom,

A¹ represents a nitrogen atom or CH,

X represents an oxygen atom or a sulfur atom,

Y represents an oxygen atom or a sulfur atom,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4, and

t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

[62] The aryltetrahydropyridine compound according to [61] or a salt thereof, wherein

Q represents Q-1,

Z¹ represents a halogen atom,

Z² represents a halogen atom or C₁-C₆ alkoxy,

X represents an oxygen atom,

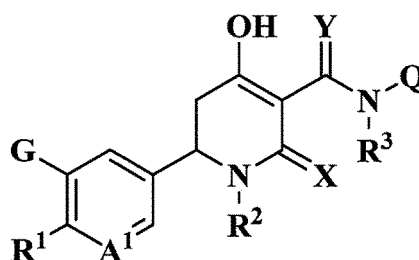
Y represents an oxygen atom,

t₄ represents an integer of 1, and

t₅ represents an integer of 1.

[63] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 32]

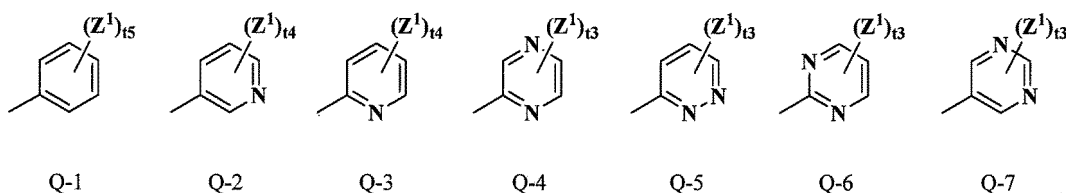


(1)

wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6 or Q-7,

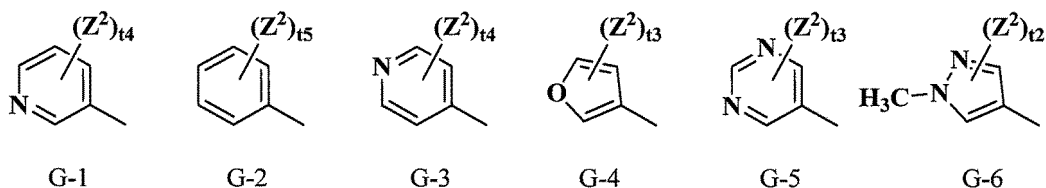
[Formula 33]



Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio or cyano,

G represents G-1, G-2, G-3, G-4, G-5 or G-6,

[Formula 34]



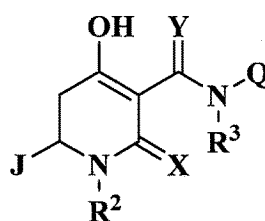
Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, halo (C_1 - C_6) alkyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, C_1 - C_6 alkylcarbonyl, nitro or cyano,
 R^1 represents a hydrogen atom, a halogen atom or halo (C_1 - C_6) alkyl,
 R^2 represents a hydrogen atom, C_1 - C_6 alkyl or C_2 - C_6 alkynyl,
 R^3 represents a hydrogen atom or C_1 - C_6 alkyl,
 A^1 represents a nitrogen atom or CH,
 X represents an oxygen atom or a sulfur atom,
 Y represents an oxygen atom or a sulfur atom,
 t_2 represents an integer of 0, 1 or 2,
 t_3 represents an integer of 0, 1, 2 or 3,
 t_4 represents an integer of 0, 1, 2, 3 or 4, and
 t_5 represents an integer of 0, 1, 2, 3, 4 or 5.

[64] The aryltetrahydropyridine compound according to [63] or a salt thereof, wherein

Z^1 represents a halogen atom, C_1 - C_6 alkyl, halo (C_1 - C_6) alkyl, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, halo (C_1 - C_6) alkylthio or cyano,
 Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, halo (C_1 - C_6) alkyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfonyl, C_1 - C_6 alkylcarbonyl, nitro or cyano,
 R^2 represents a hydrogen atom,
 R^3 represents a hydrogen atom,
 X represents an oxygen atom, and
 Y represents an oxygen atom.

[65] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 35]

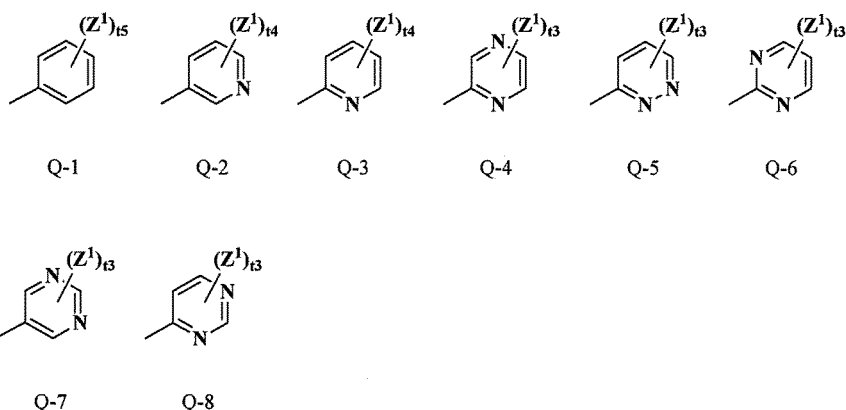


(1)

wherein

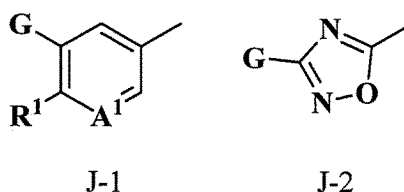
Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7 or Q-8,

[Formula 36]



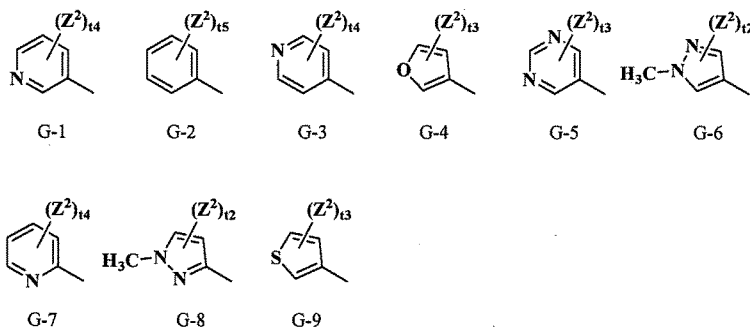
Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio or cyano,
J represents J-1 or J-2,

[Formula 37]



G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8 or G-9,

[Formula 38]



Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, C₁-C₆ alkylcarbonyl, nitro or cyano,
R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,
R² represents a hydrogen atom, C₁-C₆ alkyl or C₂-C₆ alkynyl,
R³ represents a hydrogen atom or C₁-C₆ alkyl,
A¹ represents a nitrogen atom or CH,
X represents an oxygen atom or a sulfur atom,
Y represents an oxygen atom or a sulfur atom,
t₂ represents an integer of 0, 1 or 2,
t₃ represents an integer of 0, 1, 2 or 3,
t₄ represents an integer of 0, 1, 2, 3 or 4, and
t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

[66] The aryltetrahydropyridine compound according to [65] or a salt thereof, wherein

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio or cyano,

Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfonyl, C₁-C₆ alkylcarbonyl, nitro or cyano,

R² represents a hydrogen atom,

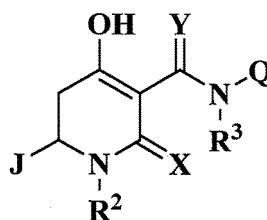
R³ represents a hydrogen atom,

X represents an oxygen atom, and

Y represents an oxygen atom.

[67] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 39]

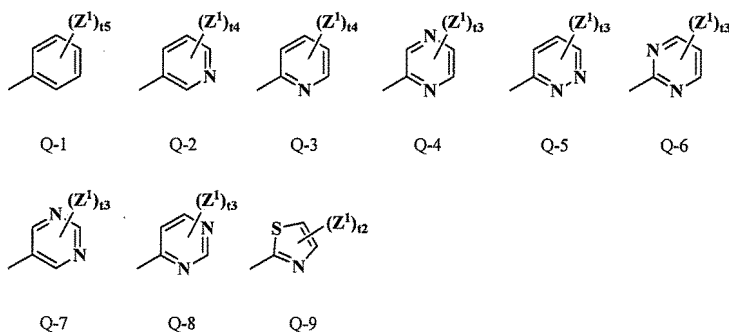


(1)

wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8 or Q-9,

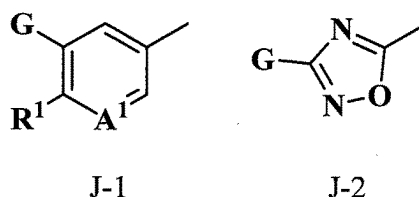
[Formula 40]



Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, cyano or nitro,

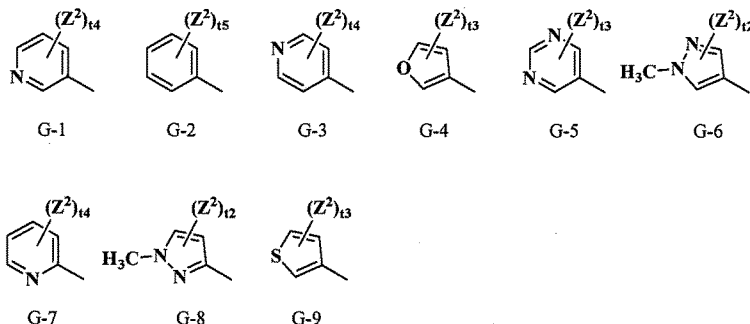
J represents J-1 or J-2,

[Formula 41]



G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8 or G-9,

[Formula 42]



Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, C₁-C₆ alkylcarbonyl, nitro or cyano,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R² represents a hydrogen atom, C₁-C₆ alkyl, C₂-C₆ alkynyl or C₁-C₆ alkoxycarbonyl,

R³ represents a hydrogen atom or C₁-C₆ alkyl,

A¹ represents a nitrogen atom or CH,

X represents an oxygen atom or a sulfur atom,

Y represents an oxygen atom or a sulfur atom,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4, and

t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

[68] The aryltetrahydropyridine compound according to [67] or a salt thereof, wherein

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio or cyano,

Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfonyl, C₁-C₆ alkylcarbonyl, nitro or cyano,

R² represents a hydrogen atom,

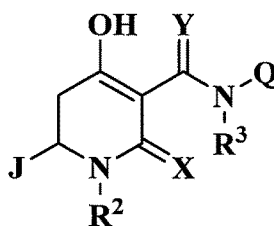
R³ represents a hydrogen atom,

X represents an oxygen atom, and

Y represents an oxygen atom.

[69] An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 43]

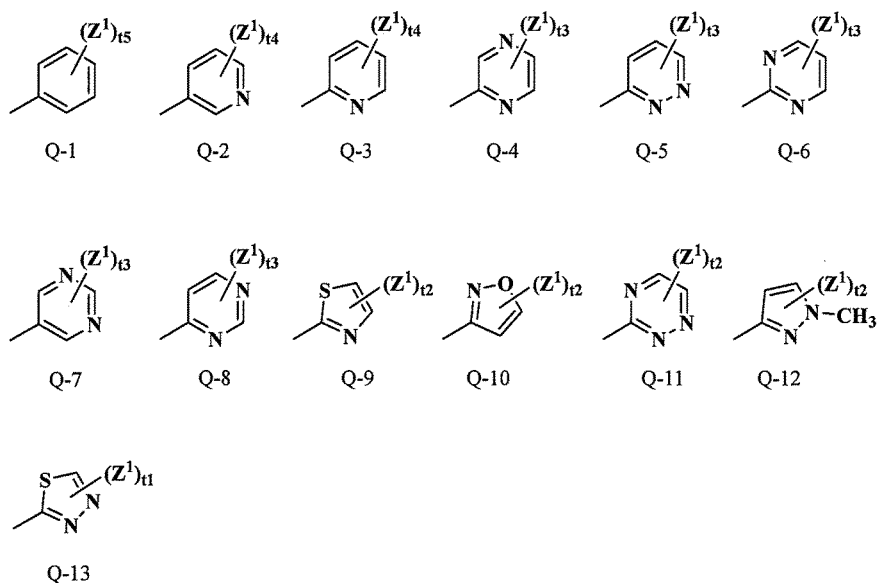


(1)

wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12 or Q-13,

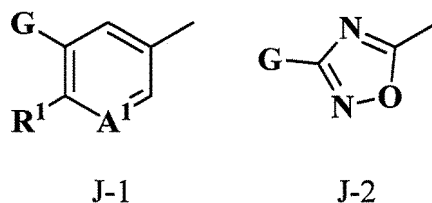
[Formula 44]



Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, hydroxy, cyano or nitro,

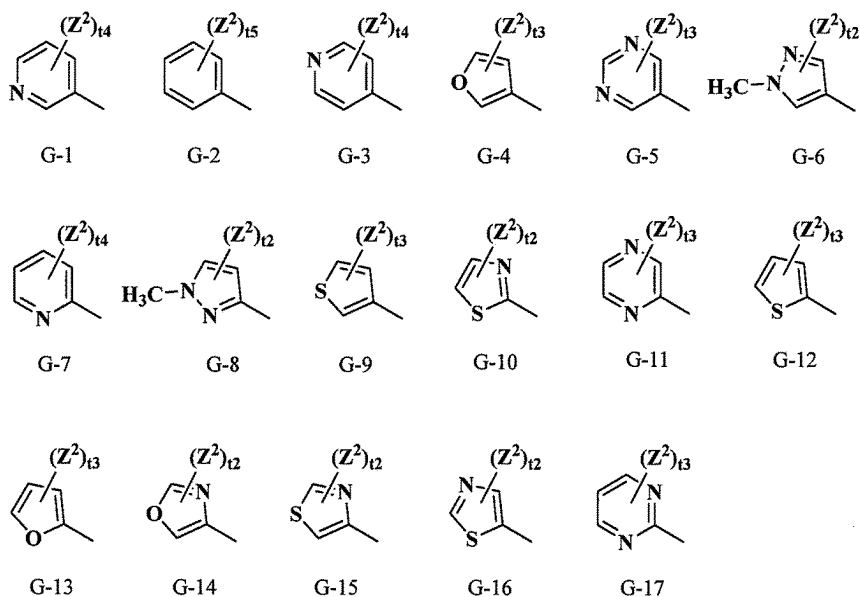
J represents J-1 or J-2,

[Formula 45]



G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16 or G-17,

[Formula 46]



Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, halo (C_1 - C_6) alkyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfonyl, C_1 - C_6 alkylcarbonyl, hydroxy, nitro or cyano,

R^1 represents a hydrogen atom, a halogen atom or halo (C_1 - C_6) alkyl,

R^2 represents a hydrogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, $-C(O)R^4$ or $-C(O)OR^5$

R^4 represents C_1 - C_6 alkyl, C_3 - C_6 cycloalkyl, C_1 - C_6 alkylcarbonyl or (C_a - C_b) alkyl substituted with R^6 ,

R^6 represents a halogen atom or C_1 - C_6 alkoxy,

R^5 represents C_1 - C_6 alkyl or C_2 - C_6 alkenyl,

R^3 represents a hydrogen atom or C_1 - C_6 alkyl,

A^1 represents a nitrogen atom or CH,

X represents an oxygen atom or a sulfur atom,

Y represents an oxygen atom or a sulfur atom,

t_1 represents an integer of 0 or 1,

t_2 represents an integer of 0, 1 or 2,

t_3 represents an integer of 0, 1, 2 or 3,

t_4 represents an integer of 0, 1, 2, 3 or 4, and

t_5 represents an integer of 0, 1, 2, 3, 4 or 5.

[70] The aryltetrahydropyridine compound according to [69] or a salt thereof, wherein

Z^2 represents a halogen atom, C_1 - C_6 alkyl, C_2 - C_6 alkenyl, halo (C_1 - C_6) alkyl, C_1 - C_6 alkoxy, halo (C_1 - C_6) alkoxy, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfonyl, C_1 - C_6 alkylcarbonyl, hydroxy, nitro or cyano,

R^2 represents a hydrogen atom, $-C(O)R^4$ or $-C(O)OR^5$,

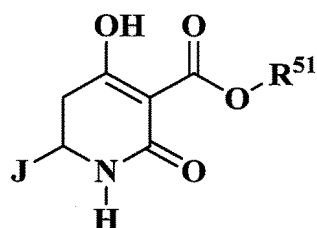
R^3 represents a hydrogen atom,

X represents an oxygen atom, and

Y represents an oxygen atom.

[71] A production intermediate for the aryltetrahydropyridine compound according to any one of [1] to [70] or a salt thereof, the production intermediate represented by a formula (1-1):

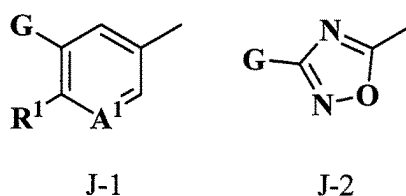
[Formula 47]



(1-1)

wherein J represents J-1 or J-2,

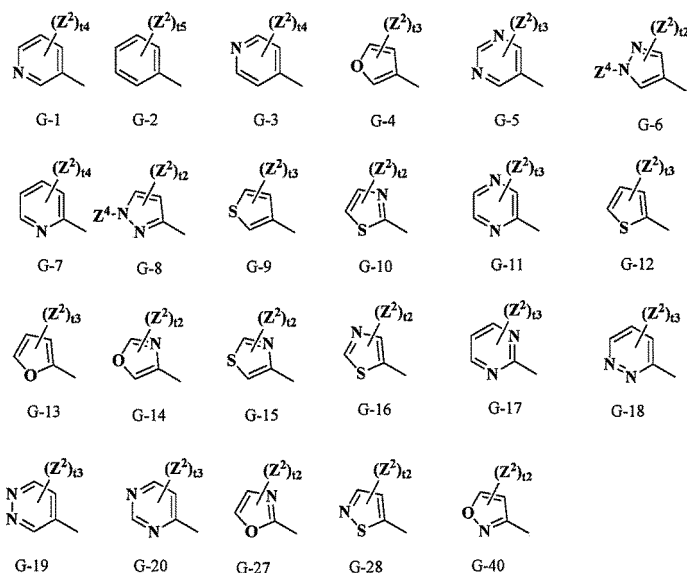
[Formula 48]



A¹ represents a nitrogen atom,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28 or G-40,

[Formula 49]



Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, di (C₁-C₆) alkylamino, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxy carbonyl, hydroxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

R¹⁴ represents C₁-C₆ alkyl,

R¹⁵ represents a hydrogen atom or C₁-C₆ alkyl,

Z⁴ represents C₁-C₆ alkyl,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R⁵¹ represents C₁-C₆ alkyl,

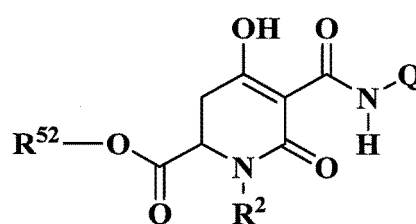
t2 represents an integer of 0, 1 or 2,
 t3 represents an integer of 0, 1, 2 or 3,
 t4 represents an integer of 0, 1, 2, 3 or 4, and
 t5 represents an integer of 0, 1, 2, 3, 4 or 5.

[72] The production intermediate according to [71] for the aryltetrahydropyridine compound or a salt thereof, wherein

J represents J-1,
 G represents G-1, G-2 or G-3,
 Z² represents a halogen atom or C₁-C₆ alkyl, and
 R¹ represents a halogen atom or halo (C₁-C₆) alkyl.

[73] A production intermediate for the aryltetrahydropyridine compound according to any one of [1] to [70] or a salt thereof, the production intermediate represented by a formula (1-2):

[Formula 50]

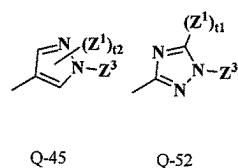
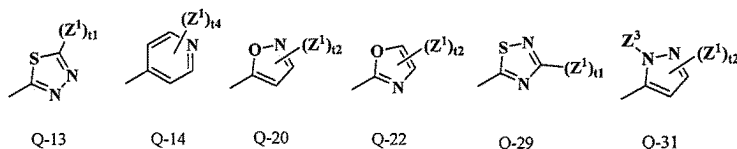
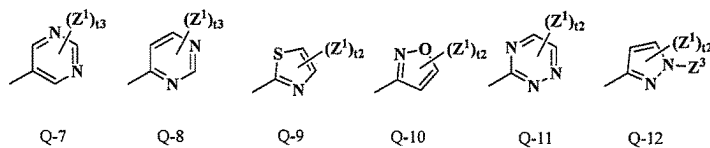
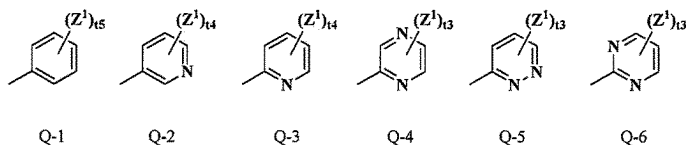


(1-2)

wherein R⁵² represents a hydrogen atom or C₁-C₆ alkyl,

R² represents a hydrogen atom, -C(O)R⁴ or -C(O)OR⁵,
 R⁴ represents C₁-C₆ alkyl,
 R⁵ represents C₁-C₆ alkyl,
 Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29, Q-31, Q-45 or Q-52,

[Formula 51]



Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, hydroxy, cyano or nitro,

Z³ represents a hydrogen atom or C₁-C₆ alkyl,

t₁ represents an integer of 0 or 1,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4, and

t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

[74] The production intermediate according to [73] for the aryltetrahydropyridine compound or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6 or Q-9,

Z¹ represents a halogen atom, C₁-C₆ alkyl or cyano, and

R² represents a hydrogen atom or -C(O)OR⁵.

[75] A pesticide containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[76] An agrochemical containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[77] A control agent for an internal or external parasite in a mammal or a bird, the control agent containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[78] The control agent according to [77], wherein the external parasite is a species belonging to Siphonaptera or a species belonging to Acari.

[79] An insecticide or acaricide containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[80] An agent for seed treatment, the agent containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[81] The agent for seed treatment according to [80], wherein the seed treatment is performed by soaking.

[82] An agent for soil treatment, the agent containing one or two or more selected from the aryltetrahydropyridine compound according to any one of [1] to [70] and salts thereof as an active ingredient.

[83] The agent for soil treatment according to [82], wherein the soil treatment is performed by soil drenching.

Examples

[0202] The following more specifically describes the present invention by showing Synthesis Examples and Test Examples for the presently invented compound as Examples, but the present invention is not limited by them.

[0203] For medium pressure preparative liquid chromatography shown in Synthesis Examples, the medium pressure separation apparatus YFLC-Wprep (flow rate: 18 ml/min, silica gel 40- μ m-column) manufactured by YAMAZEN CORPORATION was used.

[0204] Chemical shift values in proton nuclear magnetic resonance spectra (hereinafter, referred to as $^1\text{H-NMR}$) shown below were determined with use of Me_4Si (tetramethylsilane) as a standard substance in deuterated chloroform solvent at 300 MHz (model: JNM-ECX300 or JNM-ECP300, manufactured by JEOL Ltd.) or 400 MHz (model: JNM-ECZ400S, manufactured by JEOL Ltd.). Signs for chemical shift values in $^1\text{H-NMR}$ have the following meanings. s: singlet, d: doublet, dd: double doublet, t: triplet, q: quartet, m: multiplet, brs: broad singlet

Synthesis Example 1: Synthesis of N-(4-fluorophenyl)-6-[3-(6-fluoropyridin-3-yl)-4-(trifluoromethyl)phenyl]-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide (presently invented compound No. 1-001)

[0205] To a mixed solution of 94 mg of 6-[3-bromo-4-(trifluoromethyl)phenyl]-N-(4-fluorophenyl)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide, 1.6 ml of 1,4-dioxane, and 0.4 ml of water, 42 mg of 2-fluoropyridine-5-boronic acid, 83 mg of potassium carbonate, and 16 mg of a [1,1'-bis(diphenylphosphino)ferrocene]palladium (divalent) dichloride dichloromethane adduct were added, and the resultant was stirred under a nitrogen atmosphere at 90°C for 5 hours. After the completion of the reaction, 5 ml of 1 mol/l hydrochloric acid was added, and extraction was performed with ethyl acetate (5 ml $\times$ 3 times). The resulting organic layer was dehydrated and dried with anhydrous sodium sulfate, and the solvent was then distilled off under reduced pressure. The resulting residue was purified by medium pressure preparative liquid chromatography [gradient from n-hexane:ethyl acetate = 100:0 to 0:100 (volume ratio, the same applies hereinafter)], giving 31 mg of the target substance as a white solid.

Melting point: 200 to 202°C

$^1\text{H-NMR}$ (300 MHz): δ 11.5-12.0 (m, 1H), 8.18 (brs, 1H), 7.85 (d, J = 8.7 Hz, 1H), 7.65-7.8 (m, 1H), 7.4-7.65 (m, 4H), 7.33 (brs, 1H), 6.95-7.1 (m, 3H), 5.45-5.7 (m, 1H), 4.8-5.0 (m, 1H), 2.75-3.0 (m, 2H).

Synthesis Example 2: Synthesis of 6'-chloro-N-(4-chlorophenyl)-6"-fluoro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3':5',3"-terpyridine]-5-carboxamide (presently invented compound No. 2-035)

[0206] To a mixed solution of 100 mg of ethyl 6'-chloro-6"-fluoro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3':5',3"-terpyridine]-5-carboxylate and 0.7 ml of 1,4-dioxane, 32 mg of 4-chloroaniline was added, and the resultant was stirred at 80°C for 1 hour. After the completion of the reaction, the solvent was distilled off under reduced pressure. The resulting residue was washed with a mixed solution of ethyl acetate:n-hexane = 1:2, giving 41 mg of the target substance as a pale brown solid.

Melting point: 199 to 201°C

$^1\text{H-NMR}$ (300 MHz): δ 11.6 (brs, 1H), 8.48 (brs, 1H), 8.29 (brs, 1H), 7.85-8.0 (m, 1H), 7.65-7.8 (m, 1H), 7.4-7.6 (m, 2H), 7.25-7.35 (m, 2H), 7.05-7.15 (m, 2H), 5.3-5.8 (m, 1H), 4.85-4.95 (m, 1H), 2.7-3.05 (m, 2H).

Synthesis Example 3: Synthesis of N-(5-fluoropyridin-2-yl)-6-(3-(2-fluoropyridin-4-yl)-1,2,4-oxadiazol-5-yl)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide (presently invented compound No. 3-036)

[0207] To a mixed solution of 50 mg of 6-(((2-fluoroisonicotinimidamide)oxy)carbonyl)-N-(5-fluoropyridin-2-yl)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide and 1.7 ml of toluene, 17 mg of triethylamine was added, and the resultant was stirred at 110°C for 3 hours. After the completion of the reaction, the solvent was distilled off under reduced pressure. To the resulting residue, 5 ml of 1 mol/l hydrochloric acid was added, and extraction was performed with ethyl acetate (5 ml $\times$ 3 times). The resulting organic layer was dehydrated and dried with anhydrous sodium sulfate, and the solvent was then distilled off under reduced pressure. To the resulting residue, 1 ml of N,N-dimethylformamide, 3 ml of water, and 1 ml of 1 mol/l hydrochloric acid were added. A solid precipitated was collected by filtration, giving 39 mg of the target substance as a white solid.

Melting point: 159 to 161°C

[0208] The following shows a synthesis example for the production intermediate used in Synthesis Example 2 for the presently invented compound.

Intermediate Synthesis Example 1: Synthesis of ethyl 6'-chloro-6"-fluoro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3':5',3"-terpyridine]-5-carboxylate

Step 1: Synthesis of ethyl 3-(5-bromo-6-chloropyridin-3-yl)-3-(3-ethoxy-3-oxopropanamide)propanoate

[0209] To a mixed solution of 13 g of ethyl 3-amino-3-(5-bromo-6-chloropyridin-3-yl)propanoate, 142 ml of ethyl acetate, 7.2 g of sodium hydrogen carbonate, and 142 ml of water, 6.7 g of ethyl malonyl chloride was added at 0°C. After the completion of the reaction, the resulting organic layer was dehydrated and dried with brine and anhydrous sodium sulfate, and the solvent was then distilled off under reduced pressure; thus, 18 g of the target substance was given as a brown oily substance.

[0210] ¹H-NMR (300 MHz): δ 8.3-8.4 (m, 2H), 7.9-7.95 (m, 1H), 5.35-5.5 (m, 1H), 4.24 (q, J = 7.2 Hz, 2H), 4.13 (q, J = 7.2 Hz, 2H), 3.36 (brs, 2H), 2.89 (d, J = 5.7 Hz, 2H), 1.31 (t, J = 7.2 Hz, 3H), 1.20 (t, J = 7.2 Hz, 3H).

Step 2: Synthesis of ethyl 5'-bromo-6'-chloro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3'-bipyridine]-5-carboxylate

[0211] To a mixed solution of 22 g of ethyl 3-(5-bromo-6-chloropyridin-3-yl)-3-(3-ethoxy-3-oxopropanamide)propanoate and 94 ml of dehydrated ethanol, 2.0 g of sodium hydride [manufactured by YONEYAMA YAKUHI KOGYO CO., LTD., product name: sodium hydride. oily (ca. 63% by mass), purity: 57.5 to 67.5%, product code: 03414] was added, and the resultant was stirred under a nitrogen atmosphere at 55°C for 5 hours. After the completion of the reaction, the solvent was distilled off under reduced pressure. To the resulting residue, 150 ml of diisopropyl ether was added, and extraction was performed with 150 ml of water. To the resulting aqueous layer, 35% by mass hydrochloric acid was added until the pH reached 2, and extraction was performed with a mixed solution of ethyl acetate:tetrahydrofuran = 9:1 (150 ml × 3 times). The resulting organic layer was dehydrated and dried with brine and anhydrous sodium sulfate, and the solvent was then distilled off under reduced pressure; thus, 16 g of the target substance was given as a brown solid.

Melting point: 124 to 126°C

¹H-NMR (400 MHz): δ 8.36 (d, J = 2.0 Hz, 1H), 7.98 (d, J = 2.4 Hz, 1H), 6.00 (brs, 1H), 4.7-4.8 (m, 1H), 4.35-4.5 (m, 2H), 2.7-3.05 (m, 2H), 1.40 (t, J = 7.2 Hz, 3H).

Step 3: Synthesis of ethyl 6'-chloro-6"-fluoro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3':5',3"-terpyridine]-5-carboxylate

[0212] To a mixed solution of 5.6 g of ethyl 5'-bromo-6'-chloro-4-hydroxy-6-oxo-1,2,3,6-tetrahydro-[2,3'-bipyridine]-5-carboxylate, 40 ml of 1,4-dioxane, and 10 ml of water, 1.9 g of 2-fluoropyridine-5-boronic acid, 9.5 g of tripotassium phosphate, and 606 mg of a [1,1'-bis(diphenylphosphino)ferrocene]palladium (divalent) dichloride dichloromethane adduct were added, and the resultant was stirred under a nitrogen atmosphere at 55°C for 2 hours. After the completion of the reaction, 200 ml of diisopropyl ether was added, and extraction was performed with a mixed solution of 10 g of potassium carbonate and 74 ml of water. To the resulting aqueous layer, 35% by mass hydrochloric acid was added until the pH reached 2, and extraction was performed with ethyl acetate (150 ml × 3 times). The resulting organic layer was dehydrated and dried with brine and anhydrous sodium sulfate, and the solvent was then distilled off under reduced pressure. The resulting residue was washed with a mixed solution of ethanol:diisopropyl ether = 1:2, giving 2.0 g of the target substance as a pale brown solid.

Melting point: 178 to 180°C

¹H-NMR (400 MHz): δ 8.47 (d, J = 2.4 Hz, 1H), 8.30 (brs, 1H), 7.9-8.0 (m, 1H), 7.71 (d, J = 2.0 Hz, 1H), 7.05-7.1 (m, 1H), 5.70 (brs, 1H), 4.8-4.9 (m, 2H), 4.35-4.5 (m, 2H), 2.7-3.05 (m, 2H), 1.40 (t, J = 7.2 Hz, 3H).

[0213] The following shows a synthesis example for the production intermediate used in Synthesis Example 3 for the presently invented compound.

Intermediate Synthesis Example 2: Synthesis of 6-(((2-fluoroisonicotinimidamide)oxy)carbonyl)-N-(5-fluoropyridin-2-yl)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide

Step 1: Synthesis of di-tert-butyl 5-((5-fluoropyridin-2-yl)carbamoyl)-4-hydroxy-6-oxo-3,6-dihydropyridine-1,2(2H)-dicarboxylate

[0214] To a mixed solution of 18.3 g of di-tert-butyl 4-hydroxy-6-oxo-3,6-dihydropyridine-1,2(2H)-dicarboxylate and 60 ml of acetonitrile, 4.0 g of imidazole and 6.6 g of 1,1'-carbonyldiimidazole were added, and the resultant was stirred at 85°C for 30 minutes. After cooling to room temperature, 6.6 g of 5-fluoropyridin-2-amine was added, and the resultant was

stirred for 18 hours. Thereto, 350 ml of diisopropyl ether was added, the resultant was stirred at 0°C for 1.5 hours, and a solid precipitated was collected by filtration. The resulting solid was washed with a mixed solution of acetonitrile:diisopropyl ether = 1:5, giving 26.3 g of the target substance as a pale red solid.
Melting point: 152 to 154°C

Step 2: Synthesis of 5-((5-fluoropyridin-2-yl)carbamoyl)-4-hydroxy-6-oxo-1,2,3,6-tetrahydropyridine-2-carboxylic acid

[0215] To a mixed solution of 15.4 g of di-tert-butyl 5-((5-fluoropyridin-2-yl)carbamoyl)-4-hydroxy-6-oxo-3,6-dihydropyridine-1,2(2H)-dicarboxylate and 70 ml of dichloromethane, 50 ml of trifluoroacetic acid was added, and the resultant was stirred at room temperature for 25 hours. Thereto, 140 ml of toluene was added, and the solvent was distilled off under reduced pressure. Thereto, 100 ml of toluene was added, and the solvent was distilled off under reduced pressure. Thereto, 100 ml of toluene was added, and the solvent was distilled off under reduced pressure. Thereto, 100 ml of chloroform was added, and a solid was collected by filtration. The solid obtained was washed with chloroform, giving 14.6 g of the target substance as a white solid.

Melting point: 223 to 225°C

Step 3: Synthesis of 6-(((2-fluoroisonicotinimidamide)oxy)carbonyl)-N-(5-fluoropyridin-2-yl)-4-hydroxy-2-oxo-1,2,5,6-tetrahydropyridine-3-carboxamide

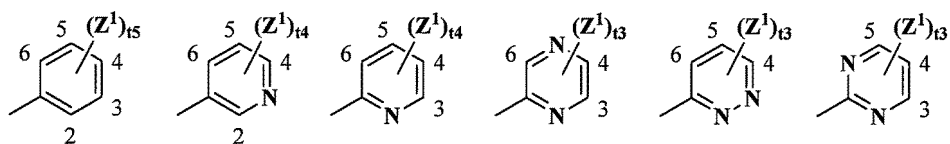
[0216] To a mixed solution of 100 mg of 5-((5-fluoropyridin-2-yl)carbamoyl)-4-hydroxy-6-oxo-1,2,3,6-tetrahydropyridine-2-carboxylic acid, 55 mg of 2-fluoro-N-hydroxyisonicotinimidamide, and 4 ml of N,N-dimethylformamide, 72 mg of 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride and 5 mg of 1-hydroxy-7-azabenzotriazole were added, and the resultant was stirred at room temperature for 1 hour. After the completion of the reaction, 12 ml of water and 1 ml of 1 mol/l hydrochloric acid were added, and a solid precipitated was collected by filtration. The solid obtained was washed with water, giving 80 mg of the target substance as a white solid.

Melting point: 146 to 148°C

[0217] The presently invented compound and production intermediates can be synthesized according to Production Methods and Synthesis Examples. Examples of aryltetrahydropyridine compounds produced in the same manner as in Synthesis Examples 1 to 3 are shown in Table 7 to Table 12, but the aryltetrahydropyridine compound of the present invention is not limited to them. Examples of production intermediates produced in the same manner as in Intermediate Synthesis Examples 1 and 2 are shown in Table 13 to Table 15, but the production intermediate of the present invention is not limited to them.

[0218] The notations Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12a, Q-12b, Q-13, Q-14, Q-20, Q-22, Q-29, Q-31a, Q-45a, and Q-52a in the tables indicate the following structures.

[Formula 52]



Q-1

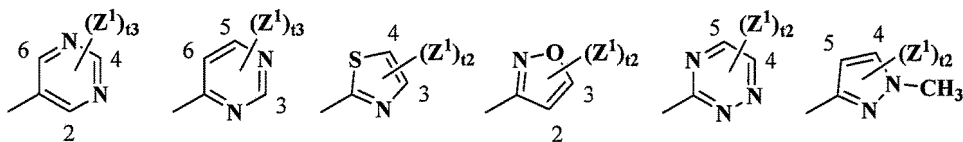
Q-2

Q-3

Q-4

Q-5

Q-6



Q-7

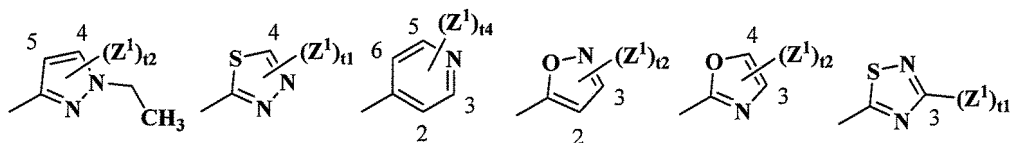
Q-8

Q-9

Q-10

Q-11

Q-12a



Q-12b

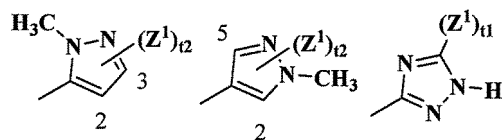
Q-13

Q-14

Q-20

Q-22

Q-29



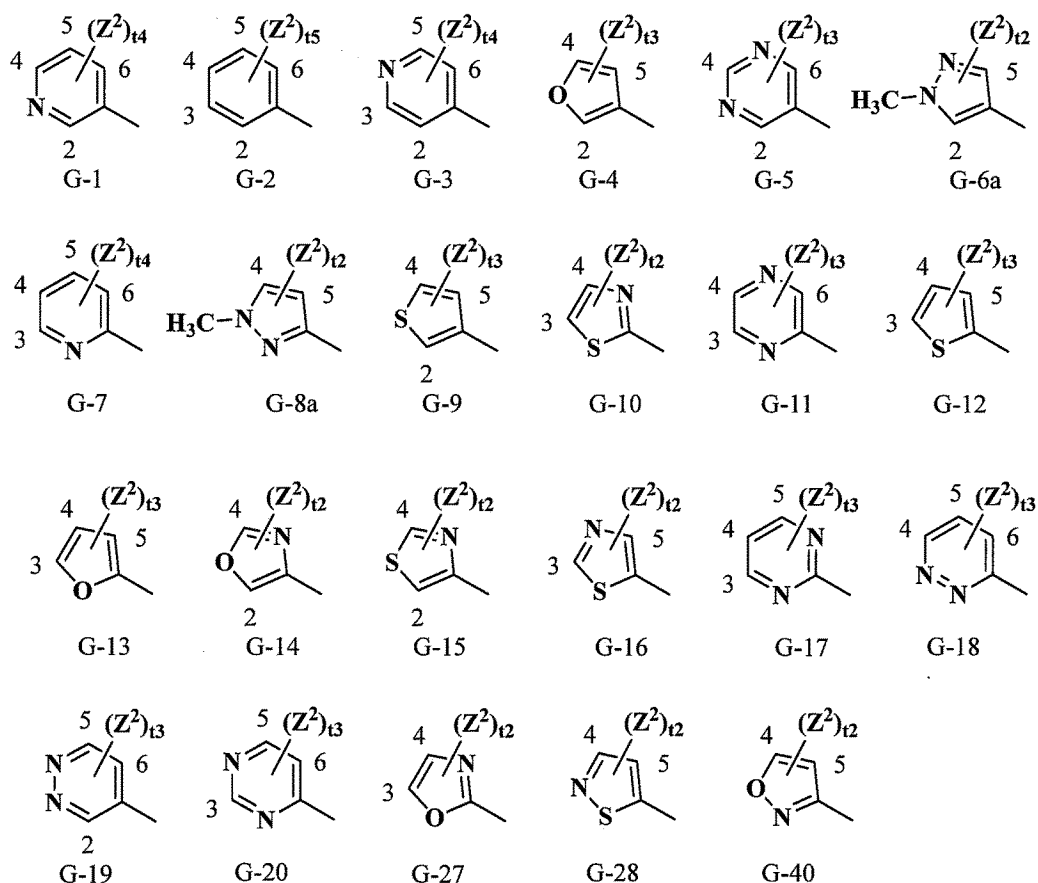
Q-31a

Q-45a

Q-52a

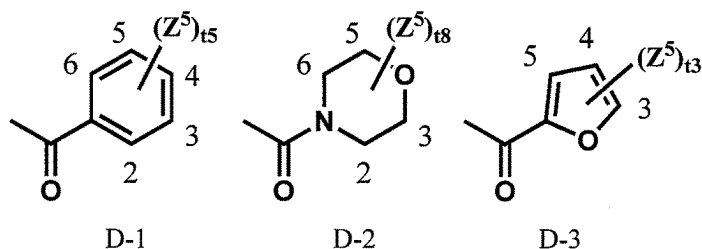
[0219] The notations G-1, G-2, G-3, G-4, G-5, G-6a, G-7, G-8a, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28, and G-40 indicate the following structures.

[Formula 53]



[0220] The notations D-1, D-2, and D-3 indicate the following structures.

[Formula 54]



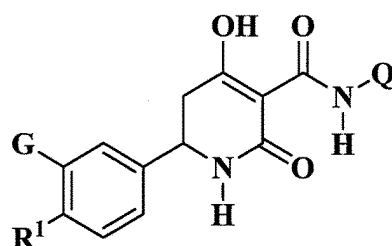
[0221] The numbers given to the structural formulas are each a number indicating the position of substitution with the substituent $(Z^1)_{t1}$, $(Z^1)_{t2}$, $(Z^1)_{t3}$, $(Z^1)_{t4}$, $(Z^1)_{t5}$, $(Z^2)_{t2}$, $(Z^2)_{t3}$, $(Z^2)_{t4}$, $(Z^2)_{t5}$, $(Z^5)_{t3}$, $(Z^5)_{t5}$ or $(Z^5)_{t8}$; for example, "Q-1(4-F)", "G-2", and "G-1(2-OCH₃, 4-OCH₃)" in the tables mean "4-fluorophenyl", "phenyl", and "2,6-dimethoxypyridin-3-yl", respectively.

[0222] The notations "i-Bu" and "c-Pr" in the tables indicate an isobutyl group and a cyclopropyl group, respectively.

[0223] "m.p." is melting point (unit: °C), and the notation "*1" indicates that the compound is an oily substance or resin-like compound without melting point. ">" in description of melting point in the tables indicates that the melting point of the compound is higher than the temperature shown; for example, the notation ">300" indicates that the compound did not melt at 300°C.

[Table 7]

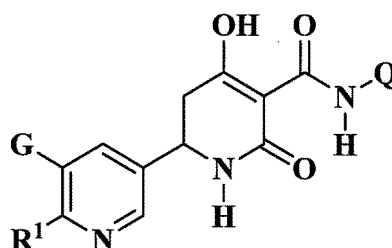
[Formula 55]



No.	R ¹	Q	G	m.p.(°C)
1-001	CF ₃	Q-1(4-F)	G-1(4-F)	200-202
1-002	CF ₃	Q-1(4-F)	G-1(5-F)	188-190
1-003	CF ₃	Q-1(4-F)	G-1(4-OCH ₃)	95-97
1-004	CF ₃	Q-1(4-F)	G-2	96-98
1-005	CF ₃	Q-1(4-F)	G-2(2-F)	177-179
1-006	CF ₃	Q-1(4-F)	G-2(3-F)	157-159
1-007	CF ₃	Q-1(4-F)	G-2(4-F)	176-178
1-008	CF ₃	Q-1(4-F)	G-2(2-SCH ₃)	195-197
1-009	CF ₃	Q-1(4-F)	G-2(4-SCH ₃)	121-123
1-010	CF ₃	Q-1(4-F)	G-2(2-COCH ₃)	181-183
1-011	CF ₃	Q-1(4-F)	G-2(3-COCH ₃)	159-161
1-012	CF ₃	Q-1(4-F)	G-2(4-COCH ₃)	176-178
1-013	CF ₃	Q-1(4-F)	G-1	232-234
1-014	CF ₃	Q-1(4-F)	G-3	176-178
1-015	CF ₃	Q-1(4-F)	G-4	174-176
1-016	CF ₃	Q-1(4-F)	G-2(2-OCH ₃)	187-189
1-017	CF ₃	Q-1(4-F)	G-2(3-OCH ₃)	137-139
1-018	CF ₃	Q-1(4-F)	G-2(4-OCH ₃)	174-176
1-019	CF ₃	Q-1(4-F)	G-2(4-SO ₂ CH ₃)	204-206
1-020	CF ₃	Q-1(4-F)	G-1(2-OCH ₃ ,4-OCH ₃)	177-179
1-021	CF ₃	Q-1(4-F)	G-1(4-CF ₃)	199-200
1-022	CF ₃	Q-1(4-F)	G-2(3-CN)	164-166
1-023	CF ₃	Q-1(4-F)	G-2(4-CN)	209-211
1-024	CF ₃	Q-1(4-F)	G-1(4-CN)	226-228

[Table 8]

[Formula 56]

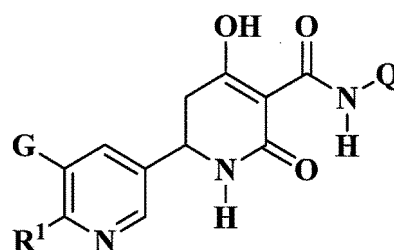


No.	R ¹	Q	G	m.p.(°C)
2-001	Cl	Q-1(4-F)	G-1(4-F)	210-212
2-002	H	Q-1(4-F)	G-2(2-CF ₃)	212-216
2-003	H	Q-1(4-F)	G-2(3-CF ₃)	175-177

O=C1C(=C(O)C(=C1N)C2=CC=C(N)C=C2C3=CC=C(C=C3)C(=O)N4C(=O)C(=O)N4C)C(=O)N5C(=O)C(=O)N5C71

(continued)

[Formula 56]



5

10

15

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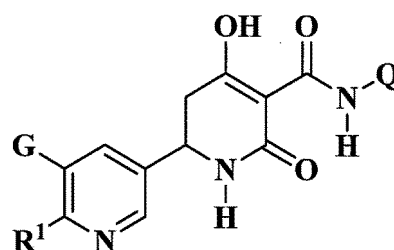
No.	R ¹	Q	G	m.p.(°C)
2-044	Cl	Q-3(4-CN)	G-1(4-Cl)	199-201
2-045	Cl	Q-4(4-Cl)	G-1(4-Cl)	209-211
2-046	Cl	Q-5(4-Cl)	G-1(4-Cl)	206-208
2-047	Cl	Q-3(4-Cl)	G-3	194-196
2-048	Cl	Q-2(4-Cl)	G-1(5-F)	224-226
2-049	Cl	Q-3(4-F)	G-1(5-F)	192-194
2-050	Cl	Q-4(4-Br)	G-1(5-F)	240-242
2-051	Cl	Q-6(4-CF ₃)	G-1(5-F)	195-197
2-052	Cl	Q-5(4-Cl)	G-1(5-F)	201-203
2-053	Cl	Q-2(4-Br)	G-1(5-F)	224-226
2-054	Cl	Q-2(4-CF ₃)	G-1(5-F)	185-187
2-055	Cl	Q-2(4-CN)	G-1(5-F)	237-239
2-056	Cl	Q-3(4-CF ₃)	G-1(5-F)	205-207
2-057	Cl	Q-3(4-CN)	G-1(5-F)	246-248
2-058	Cl	Q-1(4-F)	G-1(5-F)	231-233
2-059	Cl	Q-4(4-CF ₃)	G-1(5-F)	135-137
2-060	Cl	Q-6(4-Cl)	G-1(5-F)	220-222
2-061	Cl	Q-6(4-Br)	G-1(5-F)	217-219
2-062	Cl	Q-1(4-CH ₃)	G-1(4-F)	219-221
2-063	Cl	Q-3(4-CH ₃)	G-1(4-F)	171-173
2-064	Cl	Q-3(4-Cl)	G-2(4-CH ₂ CH ₃)	174-176
2-065	Cl	Q-3(4-Cl)	G-2(4-CH=CH ₂)	149-151
2-066	Cl	Q-3(4-Cl)	G-2(4-COCH ₃)	187-189
2-067	Cl	Q-3(4-Cl)	G-2(3-CH ₃)	161-163
2-068	Cl	Q-3(4-Cl)	G-2(3-OCH ₃)	112-114
2-069	Cl	Q-3(4-Cl)	G-2(3-COCH ₃)	131-133
2-070	Cl	Q-1(4-CN)	G-2(4-F)	205-207
2-071	Cl	Q-1(4-CN)	G-1(5-F)	160-162
2-072	Cl	Q-1(4-CN)	G-1(4-OCH ₃)	177-179
2-073	Cl	Q-7(4-CF ₃)	G-2(4-F)	185-187
2-074	Cl	Q-7(4-CF ₃)	G-1(5-F)	246-248
2-075	Cl	Q-7(4-CF ₃)	G-1(4-OCH ₃)	222-224
2-076	Cl	Q-3(4-Cl)	G-1(4-NO ₂)	204-206
2-077	Cl	Q-3(4-Cl)	G-2(4-OCH ₃)	122-124
2-078	Cl	Q-3(4-Cl)	G-2(4-SCH ₃)	122-124
2-079	Cl	Q-3(4-Cl)	G-2(4-CN)	139-141
2-080	Cl	Q-3(4-Cl)	G-2(3-F)	182-184
2-081	Cl	Q-3(4-Cl)	G-2(3-SCH ₃)	150-152
2-082	Cl	Q-3(4-Cl)	G-2	129-131
2-083	Cl	Q-1(4-CN)	G-1(4-F)	197-199

O=C1C(=C(C(=O)N1C2=CC=C(C(=C2)G)R1)C3=CC=CC=C3)C(=O)N1C(=O)C(=O)N1Q

	No.	R ¹	Q	G	m.p.(°C)
15	2-084	Cl	Q-3(4-Cl)	G-1(4-F)	205-207
	2-085	Cl	Q-4(4-Br)	G-1(4-F)	215-217
	2-086	Cl	Q-3(4-F,6-F)	G-1(4-F)	207-209
	2-087	Cl	Q-6(4-Cl)	G-1(4-F)	190-192
	2-088	Cl	Q-3(4-CN)	G-1(4-F)	195-197
20	2-089	Cl	Q-1(4-F)	G-2	222-224
	2-090	Cl	Q-1(4-CN)	G-2	220-222
	2-091	Cl	Q-2(4-F)	G-2	205-207
	2-092	Cl	Q-2(4-Cl)	G-2	229-231
25	2-093	Cl	Q-2(4-CN)	G-2	174-176
	2-094	Cl	Q-3(4-CN)	G-2	171-173
	2-095	Cl	Q-4(4-Cl)	G-2	217-219
	2-096	Cl	Q-3	G-1(4-F)	99-101
	2-097	Cl	Q-2(4-CN)	G-1	222-224
30	2-098	Cl	Q-4(4-Cl)	G-1	186-188
	2-099	Cl	Q-4(4-Br)	G-1	234-236
	2-100	Cl	Q-6(4-Cl)	G-1	237-239
	2-101	Cl	Q-8	G-1(4-F)	121-123
35	2-102	Cl	Q-2(4-OCH ₃)	G-1(4-F)	136-138
	2-103	Cl	Q-3(4-F,6-Cl)	G-1(4-F)	129-131
	2-104	Cl	Q-3(4-F,6-CH ₃)	G-1(4-F)	159-161
	2-105	Cl	Q-2(2-F,4-CH ₃)	G-1(4-F)	211-213
	2-106	Cl	Q-2(2-CH ₃ ,4-F)	G-1(4-F)	110-112
40	2-107	Cl	Q-3(4-F,5-CH ₃)	G-1(4-F)	181-183
	2-108	Cl	Q-3(3-CH ₃ ,4-F)	G-1(4-F)	208-210
	2-109	Cl	Q-2(2-F,4-F)	G-1(4-F)	200-201
	2-110	Cl	Q-3(4-Cl,6-Cl)	G-1(4-F)	138-140
45	2-111	Cl	Q-3(4-Cl,6-F)	G-1(4-F)	186-188
	2-112	Cl	Q-3(4-CH ₃ ,6-F)	G-1(4-F)	151-153
	2-113	Cl	Q-1(4-F)	G-3(3-F)	228-230
	2-114	Cl	Q-2(4-F)	G-3(3-F)	186-188
	2-115	Cl	Q-3(4-F)	G-3(3-F)	208-210
50	2-116	Cl	Q-2(2-CN,4-Cl)	G-1(4-F)	209-211
	2-117	Cl	Q-2(4-Cl,6-OCH ₃)	G-1(4-F)	201-203
	2-118	Cl	Q-2(2-OCH ₃ ,4-Cl)	G-1(4-F)	129-131
	2-119	Cl	Q-2(4-CH ₃)	G-1(4-F)	161-163
55	2-120	Cl	Q-6(4-CH ₃)	G-1(4-F)	97-99
	2-121	Cl	Q-1(4-OCF ₃)	G-1(4-F)	214-216
	2-122	Cl	Q-3(4-CF ₃ ,6-F)	G-1(4-F)	177-179
	2-123	Cl	Q-6(4-Br)	G-1(4-F)	186-188

(continued)

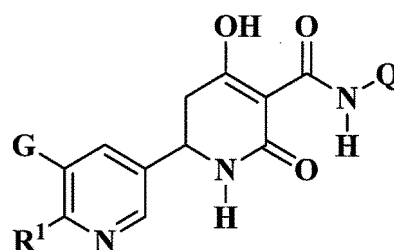
[Formula 56]



	No.	R ¹	Q	G	m.p.(°C)
15	2-124	Cl	Q-2(4-F,5-CH ₃)	G-1(4-F)	181-183
	2-125	Cl	Q-2(4-F,6-CH ₃)	G-1(4-F)	187-189
	2-126	Cl	Q-2(4-Cl,5-Cl)	G-1(4-F)	169-171
	2-127	Cl	Q-3(4-Cl,6-CN)	G-1(4-F)	182-184
	2-128	Cl	Q-2(2-Cl,4-Cl)	G-1(4-F)	211-213
20	2-129	Cl	Q-2(4-Cl,5-CH ₃)	G-1(4-F)	156-158
	2-130	Cl	Q-3(4-Cl,6-CH ₃)	G-1(4-F)	177-179
	2-131	Cl	Q-4(4-Cl,6-Cl)	G-1(4-F)	186-188
	2-132	Cl	Q-3(3-F,4-Br)	G-1(4-F)	171-173
	2-133	Cl	Q-4	G-1(4-F)	146-148
25	2-134	Cl	Q-6	G-1(4-F)	151-153
	2-135	Cl	Q-9	G-1(4-F)	199-201
	2-136	Cl	Q-3(5-F)	G-1(4-F)	124-126
	2-137	Cl	Q-2(5-F)	G-1(4-F)	226-228
	2-138	Cl	Q-3(4-Br,6-F)	G-1(4-F)	159-161
30	2-139	Cl	Q-2(4-Br,5-F)	G-1(4-F)	219-221
	2-140	Cl	Q-3(4-Br,5-F)	G-1(4-F)	218-220
	2-141	Cl	Q-3(3-F)	G-1(4-F)	187-189
	2-142	Cl	Q-3(6-F)	G-1(4-F)	181-183
	2-143	Cl	Q-4(4-CN)	G-1(4-F)	169-171
35	2-144	Cl	Q-3(4-Br)	G-1(4-F)	206-208
	2-145	Cl	Q-3(4-CF ₃)	G-1(4-F)	209-211
	2-146	Cl	Q-2(4-F)	G-1(5-Cl)	122-124
	2-147	Cl	Q-4	G-1(5-Cl)	172-174
	2-148	Cl	Q-4	G-1(5-CH ₃)	191-193
40	2-149	Cl	Q-4	G-1(4-CH ₃)	191-193
	2-150	Cl	Q-3(3-Cl)	G-1(4-F)	187-189
	2-151	Cl	Q-3(3-CH ₃)	G-1(4-F)	197-199
	2-152	Cl	Q-3(4-NO ₂)	G-1(4-F)	202-204
	2-153	Cl	Q-3(5-CH ₃)	G-1(4-F)	107-109
45	2-154	Cl	Q-9(4-CH ₃)	G-1(4-F)	207-209
	2-155	Cl	Q-2(4-Cl)	G-3(3-F)	191-193
	2-156	Cl	Q-3(4-Cl)	G-3(3-F)	180-182
	2-157	Cl	Q-3	G-3(3-F)	201-203
	2-158	Cl	Q-1(4-CN)	G-3(3-F)	219-221
50	2-159	Cl	Q-3(4-CN)	G-3(3-F)	221-223
	2-160	Cl	Q-3(4-F,6-F)	G-3(3-F)	199-201
	2-161	Cl	Q-4	G-3(3-F)	205-207
	2-162	Cl	Q-3(4-CH ₃)	G-3(3-F)	192-194
	2-163	Cl	Q-3(4-Cl,6-F)	G-3(3-F)	183-185

(continued)

[Formula 56]



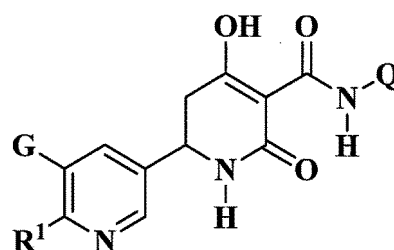
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	No.	R ¹	Q	G	m.p.(°C)
15	2-164	Cl	Q-9	G-3(3-F)	212-214
	2-165	Cl	Q-6(4-Cl)	G-3(3-F)	199-201
	2-166	Cl	Q-3(6-F)	G-3(3-F)	202-204
	2-167	CF ₃	Q-3(4-F)	G-1(4-F)	178-180
	2-168	CF ₃	Q-2(4-F)	G-1(4-F)	174-176
20	2-169	CF ₃	Q-3(4-Cl)	G-1(4-F)	191-193
	2-170	CF ₃	Q-2(4-Cl)	G-1(4-F)	131-132
	2-171	CF ₃	Q-3(4-CH ₃)	G-1(4-F)	111-113
	2-172	CF ₃	Q-12a	G-1(4-F)	191-193
25	2-173	CF ₃	Q-9(4-CH ₃)	G-1(4-F)	199-201
	2-174	CF ₃	Q-9(4-Cl)	G-1(4-F)	159-161
	2-175	CF ₃	Q-4(4-Cl)	G-1(4-F)	204-206
	2-176	CF ₃	Q-4	G-1(4-F)	194-196
	2-177	CF ₃	Q-3(4-Br)	G-1(4-F)	186-188
30	2-178	CF ₃	Q-1(4-F)	G-1(4-F)	201-203
	2-179	CF ₃	Q-3(4-CF ₃)	G-1(4-F)	204-206
	2-180	CF ₃	Q-6(4-Cl)	G-1(4-F)	182-184
	2-181	CF ₃	Q-3(4-Cl,6-F)	G-1(4-F)	181-183
	2-182	CF ₃	Q-3(4-F,6-F)	G-1(4-F)	199-201
35	2-183	CF ₃	Q-1(4-CN)	G-1(4-F)	172-174
	2-184	CF ₃	Q-9	G-1(4-F)	199-201
	2-185	CF ₃	Q-13(4-CH ₃)	G-1(4-F)	191-193
	2-186	Cl	Q-3(4-F)	G-3(3-Cl)	162-164
40	2-187	Cl	Q-3(4-Cl)	G-3(3-Cl)	124-126
	2-188	Cl	Q-4(4-Cl)	G-3(3-Cl)	131-133
	2-189	Cl	Q-2(4-Cl)	G-3(3-Cl)	171-173
	2-190	Cl	Q-3	G-3(3-Cl)	142-144
	2-191	CF ₃	Q-3(4-F)	G-3(3-F)	169-171
45	2-192	CF ₃	Q-2(4-F)	G-3(3-F)	149-151
	2-193	CF ₃	Q-3(4-Cl)	G-3(3-F)	112-114
	2-194	CF ₃	Q-2(4-Cl)	G-3(3-F)	136-138
	2-195	CF ₃	Q-3(4-CH ₃)	G-3(3-F)	116-118
	2-196	CF ₃	Q-12a	G-3(3-F)	101-103
50	2-197	CF ₃	Q-9(4-CH ₃)	G-3(3-F)	111-113
	2-198	CF ₃	Q-4(4-Cl)	G-3(3-F)	154-156
	2-199	CF ₃	Q-3	G-3(3-F)	151-153
	2-200	CF ₃	Q-3	G-1(4-F)	136-138
	2-201	CF ₃	Q-4	G-3(3-F)	157-159
55	2-202	CF ₃	Q-3(4-Br)	G-3(3-F)	174-176
	2-203	CF ₃	Q-1(4-F)	G-3(3-F)	172-174

(continued)

[Formula 56]



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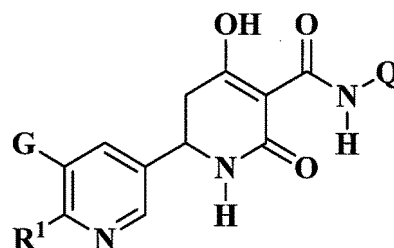
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No.	R ¹	Q	G	m.p.(°C)
2-204	CF ₃	Q-3(4-CF ₃)	G-3(3-F)	116-118
2-205	CF ₃	Q-6(4-Cl)	G-3(3-F)	141-143
2-206	CF ₃	Q-3(4-Cl,6-F)	G-3(3-F)	154-156
2-207	CF ₃	Q-3(4-F,6-F)	G-3(3-F)	159-161
2-208	CF ₃	Q-1(4-CN)	G-3(3-F)	144-146
2-209	CF ₃	Q-9	G-3(3-F)	114-116
2-210	CF ₃	Q-13(4-CH ₃)	G-3(3-F)	168-170
2-211	CF ₃	Q-3(3-F)	G-3(3-F)	149-151
2-212	CF ₃	Q-3(6-F)	G-3(3-F)	99-101
2-213	CF ₃	Q-3(4-CN)	G-3(3-F)	112-114
2-214	CF ₃	Q-2(4-CN)	G-3(3-F)	122-124
2-215	CF ₃	Q-2(4-CF ₃)	G-3(3-F)	112-114
2-216	CF ₃	Q-4(4-Br)	G-3(3-F)	177-179
2-217	CF ₃	Q-6(4-Br)	G-3(3-F)	144-146
2-218	CF ₃	Q-1(4-CH ₃)	G-3(3-F)	187-189
2-219	CF ₃	Q-3(3-Cl)	G-3(3-F)	164-166
2-220	Cl	Q-3(4-Cl)	G-2(4-F)	146-148
2-221	Cl	Q-2(4-Cl)	G-2(4-F)	199-201
2-222	Cl	Q-3(4-CH ₃)	G-2(4-F)	162-164
2-223	Cl	Q-12a	G-2(4-F)	107-109
2-224	Cl	Q-9(4-CH ₃)	G-2(4-F)	156-158
2-225	Cl	Q-4(4-Cl)	G-2(4-F)	156-158
2-226	Cl	Q-3	G-2(4-F)	141-143
2-227	Cl	Q-4	G-2(4-F)	132-134
2-228	Cl	Q-3(4-CN)	G-2(4-F)	122-124
2-229	Cl	Q-1(4-F)	G-2(4-F)	187-189
2-230	Cl	Q-3(4-CF ₃)	G-2(4-F)	164-166
2-231	Cl	Q-6(4-Cl)	G-2(4-F)	171-173
2-232	Cl	Q-3(4-Cl,6-F)	G-2(4-F)	174-176
2-233	Cl	Q-2(4-CN)	G-2(4-F)	200-202
2-234	Cl	Q-2(4-CF ₃)	G-2(4-F)	181-183
2-235	Cl	Q-9	G-2(4-F)	154-156
2-236	Cl	Q-13(4-CH ₃)	G-2(4-F)	184-186
2-237	Cl	Q-11	G-2(4-F)	161-163
2-238	Cl	Q-6	G-2(4-F)	127-129
2-239	Cl	Q-13	G-2(4-F)	146-148
2-240	Cl	Q-10(3-CH ₃)	G-2(4-F)	172-174
2-241	Cl	Q-1(4-OH)	G-2(4-F)	129-131
2-242	Cl	Q-1(4-CH=CH ₂)	G-2(4-F)	182-184
2-243	Cl	Q-1(4-C≡CH)	G-2(4-F)	164-166

(continued)

[Formula 56]



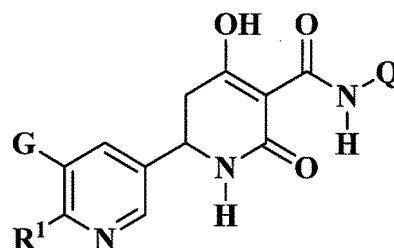
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	No.	R ¹	Q	G	m.p.(°C)
15	2-244	CF ₃	Q-3(4-F)	G-2(4-F)	111-113
	2-245	CF ₃	Q-3(4-F)	G-2(4-OCH ₃)	167-169
	2-246	CF ₃	Q-3(4-F)	G-2(3-F)	159-161
	2-247	CF ₃	Q-3(4-F)	G-2(3-OCH ₃)	144-146
	2-248	CF ₃	Q-3(4-F)	G-2(2-CH ₃)	176-178
20	2-249	CF ₃	Q-3(4-F)	G-2(2-F)	216-218
	2-250	CF ₃	Q-3(4-F)	G-2(2-OCH ₃)	174-176
	2-251	CF ₃	Q-3(4-F)	G-1	136-138
	2-252	Cl	Q-3(4-F)	G-2(3-CH ₃)	176-178
25	2-253	Cl	Q-2(4-F)	G-2(3-CH ₃)	179-181
	2-254	Cl	Q-2(4-Cl)	G-2(3-CH ₃)	201-203
	2-255	Cl	Q-3(4-CH ₃)	G-2(3-CH ₃)	179-181
	2-256	Cl	Q-12a	G-2(3-CH ₃)	171-173
	2-257	Cl	Q-9(4-CH ₃)	G-2(3-CH ₃)	207-209
30	2-258	Cl	Q-1(4-OCH ₃)	G-2(3-CH ₃)	202-204
	2-259	Cl	Q-4(4-Cl)	G-2(3-CH ₃)	196-198
	2-260	Cl	Q-3	G-2(3-CH ₃)	111-113
	2-261	Cl	Q-4	G-2(3-CH ₃)	181-183
	2-262	Cl	Q-3(4-CN)	G-2(3-CH ₃)	179-181
35	2-263	Cl	Q-1(4-F)	G-2(3-CH ₃)	202-204
	2-264	Cl	Q-6(4-Cl)	G-2(3-CH ₃)	174-176
	2-265	Cl	Q-3(4-Cl,6-F)	G-2(3-CH ₃)	181-183
	2-266	Cl	Q-2(4-CN)	G-2(3-CH ₃)	189-191
	2-267	Cl	Q-2(4-CF ₃)	G-2(3-CH ₃)	204-206
40	2-268	Cl	Q-9	G-2(3-CH ₃)	197-199
	2-269	Cl	Q-1(4-CN)	G-2(3-CH ₃)	172-174
	2-270	Cl	Q-11	G-2(3-CH ₃)	152-154
	2-271	Cl	Q-6	G-2(3-CH ₃)	126-128
	2-272	Cl	Q-3(3-CH ₃)	G-2(3-CH ₃)	179-181
45	2-273	Cl	Q-3(5-CH ₃)	G-2(3-CH ₃)	182-184
	2-274	Cl	Q-2(2-Cl)	G-2(3-CH ₃)	187-189
	2-275	Cl	Q-2(2-F)	G-2(3-CH ₃)	164-166
	2-276	Cl	Q-3(3-Cl)	G-2(3-CH ₃)	191-193
	2-277	Cl	Q-3(3-F)	G-2(3-CH ₃)	186-188
50	2-278	Cl	Q-3(4-NO ₂)	G-2(3-CH ₃)	187-189
	2-279	Cl	Q-1(4-NO ₂)	G-2(3-CH ₃)	172-174
	2-280	Cl	Q-1(4-C≡CH)	G-2(3-CH ₃)	169-171
	2-281	Cl	Q-6(3-Cl)	G-2(3-CH ₃)	147-149
	2-282	Cl	Q-1(4-CH ₃)	G-2(3-CH ₃)	186-188
55	2-283	Cl	Q-8(3-Cl)	G-2(3-CH ₃)	137-139

(continued)

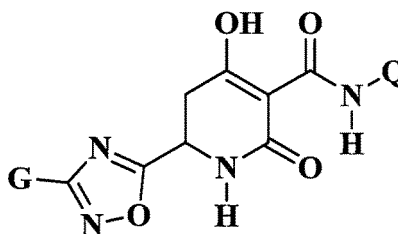
[Formula 56]



No.	R ¹	Q	G	m.p.(°C)
2-284	Cl	Q-1(3-SCH ₃)	G-2(3-CH ₃)	191-193
2-285	Cl	Q-1(3-SO ₂ CH ₃)	G-2(3-CH ₃)	156-158
2-286	Cl	Q-22	G-1(4-F)	*1
2-287	Cl	Q-2	G-1(4-F)	*1
2-288	Cl	Q-14	G-1(4-F)	*1
2-289	Cl	Q-5	G-1(4-F)	*1
2-290	Cl	Q-31a	G-2(4-F)	139-140
2-291	Cl	Q-52a	G-2(4-F)	152-154
2-292	Cl	Q-1(4-C(O)OCH ₃)	G-2(4-F)	194-196
2-293	Cl	Q-1 (4-C(O)OH)	G-2(4-F)	231-233
2-294	Cl	Q-1(4-C(O)N(H)CH ₃)	G-2(4-F)	212-214
2-295	Cl	Q-1(4-C(O)CH ₃)	G-2(4-F)	211-213
2-296	Cl	Q-1(4-C(O)OC(CH ₃) ₃)	G-2(4-F)	156-158
2-297	CF ₃	Q-3(4-F)	G-3(3-CF ₃)	129-131
2-298	CF ₃	Q-3(4-F)	G-3(3-CH ₃)	206-208
2-299	Cl	Q-3(4-CF ₃)	G-3(3-F)	182-184
2-300	Cl	Q-4(4-Cl)	G-3(3-F)	172-174
2-301	Cl	Q-2(4-CN)	G-3(3-F)	216-218
2-302	Cl	Q-3(3-CH ₃)	G-3(3-F)	207-209
2-303	Cl	Q-3(4-Br)	G-3(3-F)	191-193
2-304	Cl	Q-4(4-Br)	G-3(3-F)	154-156
2-305	Cl	Q-3(3-F)	G-3(3-F)	209-211

[Table 9]

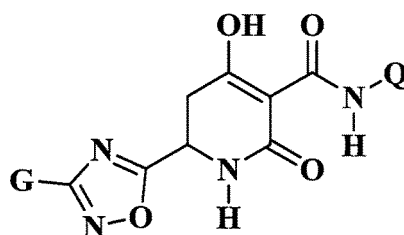
[Formula 57]



No.	Q	G	m.p.(°C)
3-001	Q-1(4-F)	G-2	200-202
3-002	Q-1(4-F)	G-2(2-CF ₃)	177-179
3-003	Q-1(4-F)	G-2(4-Cl)	228-230
3-004	Q-1(4-F)	G-2(4-CF ₃)	217-219
3-005	Q-1(4-F)	G-2(3-CF ₃)	181-183

(continued)

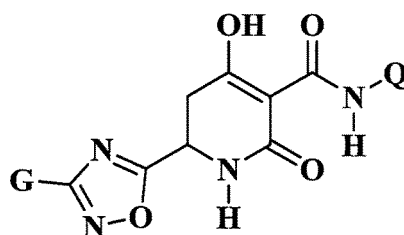
[Formula 57]



No.	Q	G	m.p.(°C)
3-006	Q-1(4-F)	G-7	206-208
3-007	Q-1(4-F)	G-1	207-209
3-008	Q-1(4-F)	G-2(4-SO ₂ CH ₃)	226-228
3-009	Q-1(4-F)	G-7(4-F)	201-203
3-010	Q-1(4-F)	G-2(4-F)	228-230
3-011	Q-1(4-F)	G-2(3-F)	221-223
3-012	Q-1(4-F)	G-2(2-F)	207-209
3-013	Q-1(4-F)	G-6a(2-Cl)	238-240
3-014	Q-1(4-F)	G-8a	230-232
3-015	Q-1(4-F)	G-1(4-Cl)	230-232
3-016	Q-1(4-F)	G-1(4-F)	216-218
3-017	Q-2(4-Cl)	G-2	230-232
3-018	Q-2(4-Cl)	G-2(3-F)	225-227
3-019	Q-2(4-Cl)	G-2(2-F)	229-231
3-020	Q-1(4-F)	G-7(3-F)	222-224
3-021	Q-1(4-F)	G-1(5-F)	208-210
3-022	Q-1(4-F)	G-3(3-F)	216-218
3-023	Q-1(4-F)	G-7(6-F)	215-217
3-024	Q-1(4-F)	G-9(5-Br)	210-212
3-025	Q-1(4-F)	G-7(5-F)	193-195
3-026	Q-1(4-F)	G-2(2-F,5-F)	241-243
3-027	Q-1(4-F)	G-2(3-F,4-F)	212-214
3-028	Q-1(4-F)	G-2(3-Br)	199-201
3-029	Q-1(4-F)	G-2(3-Cl)	208-210
3-030	Q-1(4-F)	G-2(3-CH ₃)	191-193
3-031	Q-1(4-F)	G-3	239-241
3-032	Q-2(4-F)	G-1(4-F)	228-230
3-033	Q-1(4-F)	G-2(2-F,3-F)	242-244
3-034	Q-1(4-F)	G-2(3-F,5-F)	219-221
3-035	Q-3(4-F)	G-1(4-F)	214-216
3-036	Q-3(4-F)	G-3(3-F)	159-161
3-037	Q-2(4-F)	G-3(3-F)	216-218
3-038	Q-2(4-F)	G-3	229-231
3-039	Q-3(4-F)	G-7(3-F)	187-189
3-040	Q-3(4-F)	G-7(6-F)	189-191
3-041	Q-3(4-F)	G-7(5-F)	206-208
3-042	Q-3(4-F)	G-7(4-F)	169-171
3-043	Q-3(4-F)	G-6a(2-Cl)	181-183
3-044	Q-3(4-F)	G-3	197-199
3-045	Q-3(4-F)	G-7	207-209
3-046	Q-2(4-F)	G-7(3-F)	191-193

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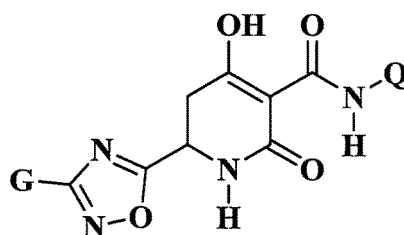
[Formula 57]



No.	Q	G	m.p.(°C)
3-047	Q-2(4-F)	G-7(6-F)	197-199
3-048	Q-2(4-F)	G-6a(2-Cl)	222-224
3-049	Q-3(4-F)	G-2(2-F,3-F)	192-194
3-050	Q-3(4-F)	G-2(2-F,5-F)	207-209
3-051	Q-3(4-F)	G-2(3-Br)	197-199
3-052	Q-3(4-F)	G-2(3-Cl)	199-201
3-053	Q-3(4-F)	G-2(3-CH ₃)	194-196
3-054	Q-3(4-F)	G-1(4-Cl)	241-243
3-055	Q-3(4-F)	G-2	187-189
3-056	Q-3(4-F)	G-2(4-F)	177-179
3-057	Q-3(4-F)	G-2(3-F)	191-193
3-058	Q-3(4-F)	G-2(2-F)	196-198
3-059	Q-3(4-F)	G-2(3-F,5-F)	186-187
3-060	Q-2(4-Cl)	G-3(3-F)	217-221
3-061	Q-3(4-F)	G-3(3-CH ₃)	101-103
3-062	Q-3(4-F)	G-2(3-F,4-F)	194-196
3-063	Q-3(4-F)	G-2(2-F,4-F)	192-194
3-064	Q-3(4-F)	G-3(2-F)	204-206
3-065	Q-3	G-3(3-F)	194-196
3-066	Q-4(4-Br)	G-3(3-F)	199-201
3-067	Q-6(4-Cl)	G-3(3-F)	199-201
3-068	Q-3(4-Br)	G-3(3-F)	221-223
3-069	Q-3(4-Cl)	G-3(3-F)	209-211
3-070	Q-2(4-CN)	G-3(3-F)	231-233
3-071	Q-1(4-CN)	G-3(3-F)	203-205
3-072	Q-3(4-CN)	G-3(3-F)	97-99
3-073	Q-3(4-F,6-F)	G-3(3-F)	97-99
3-074	Q-1(4-Cl)	G-3(3-F)	209-211
3-075	Q-4	G-3(3-F)	167-169
3-076	Q-4(4-Cl)	G-3(3-F)	187-189
3-077	Q-3(4-Cl,6-F)	G-3(3-F)	131-133
3-078	Q-3(4-CF ₃)	G-3(3-F)	129-131
3-079	Q-2(4-Cl)	G-1(4-F)	224-226
3-080	Q-2(4-Cl)	G-2(4-F)	241-243
3-081	Q-2(4-F)	G-7(4-F)	198-200
3-082	Q-2(4-F)	G-2(4-F)	224-226
3-083	Q-3(4-F)	G-1(5-F)	189-191
3-084	Q-3(4-F)	G-2(3-CF ₃)	184-186
3-085	Q-3(4-F)	G-8a	207-209
3-086	Q-3(4-F)	G-9(5-Br)	144-146
3-087	Q-3(4-F)	G-1(4-CH ₃)	232-234

(continued)

[Formula 57]



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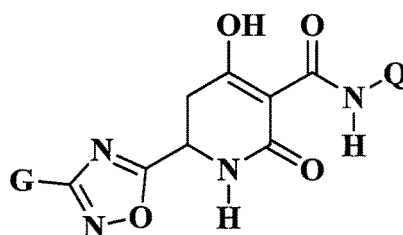
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No.	Q	G	m.p.(°C)
3-088	Q-3(4-F)	G-10	185-187
3-089	Q-1(4-F)	G-3(3-CH ₃)	207-209
3-090	Q-1(4-F)	G-3(3-Cl)	196-198
3-091	Q-3(4-F)	G-11	217-219
3-092	Q-3(4-F)	G-12	209-211
3-093	Q-3(4-F)	G-13	212-214
3-094	Q-3(4-F)	G-13(3-CH ₃)	211-212
3-095	Q-3(4-F)	G-14	207-209
3-096	Q-3(4-F)	G-15	199-201
3-097	Q-3(4-F)	G-16	211-212
3-098	Q-3(4-F)	G-3(3-Cl)	174-177
3-099	Q-3(4-F)	G-3(3-OH)	201-203
3-100	Q-3(4-F)	G-3(3-OCH ₃)	144-146
3-101	Q-3(4-F)	G-1(4-OH)	214-216
3-102	Q-3(4-Cl)	G-1(4-F)	182-184
3-103	Q-3	G-1(4-F)	184-186
3-104	Q-3(4-CH ₃)	G-1(4-F)	185-187
3-105	Q-9(4-CH ₃)	G-1(4-F)	208-210
3-106	Q-1(2-F,4-Cl)	G-3(3-F)	182-184
3-107	Q-1(3-F,4-F)	G-3(3-F)	174-176
3-108	Q-1(3-F,5-F)	G-3(3-F)	212-214
3-109	Q-1(4-F)	G-9	222-224
3-110	Q-3(4-F)	G-9	218-220
3-111	Q-1(4-F)	G-17	226-228
3-112	Q-3(4-F)	G-17	219-221
3-113	Q-3(4-F)	G-6a(2-Cl,5-CH ₃)	159-161
3-114	Q-3(4-F)	G-6a(2-Cl,5-Cl)	171-173
3-115	Q-1(4-F)	G-6a(2-Cl,5-Cl)	199-201
3-116	Q-2(4-OCH ₃)	G-3(3-F)	202-204
3-117	Q-1(4-F)	G-2(4-N(CH ₃) ₂)	222-225
3-118	Q-3(4-F)	G-2(4-N(CH ₃) ₂)	219-220
3-119	Q-3(4-F)	G-7(3-CH ₃)	208-210
3-120	Q-1(3-Cl,4-NO ₂)	G-3(3-F)	279-281
3-121	Q-20(3-CH ₃)	G-3(3-F)	298-300
3-122	Q-12a	G-3(3-F)	201-203
3-123	Q-45 _a	G-3(3-F)	209-211
3-124	Q-3(4-F)	G-2(3-C(=NOCH ₃)H)	184-186
3-125	Q-3(4-F)	G-2(3-C(=NOCH ₃)CH ₃)	211-213
3-126	Q-2	G-3(3-F)	191-193
3-127	Q-3(4-CH ₃)	G-2(4-F)	182-184
3-128	Q-3(4-CH ₃)	G-2(3-F)	167-169

(continued)

[Formula 57]



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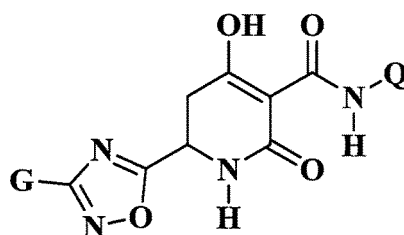
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No.	Q	G	m.p.(°C)
3-129	Q-3(4-CH ₃)	G-2(2-F)	157-159
3-130	Q-3(4-F)	G-1(5-CH ₃)	229-231
3-131	Q-1(4-F)	G-2(2-F,4-F)	213-215
3-132	Q-3	G-2(2-F,4-F)	196-198
3-133	Q-3(4-F)	G-3(3-CF ₃)	209-211
3-134	Q-3(4-F)	G-19	196-198
3-135	Q-3(4-F)	G-6a(5-Cl)	186-188
3-136	Q-4(4-Cl)	G-6a(2-Cl,5-CH ₃)	179-181
3-137	Q-3(4-F)	G-2(4-OCH ₃)	199-201
3-138	Q-3(4-F)	G-2(3-F,4-F,5-F)	214-216
3-139	Q-3(4-F)	G-2(2-F,4-F,5-F)	222-224
3-140	Q-3(4-F)	G-2(2-Cl,4-F)	162-164
3-141	Q-3(4-F)	G-2(3-Cl,4-F)	197-199
3-142	Q-3(4-F)	G-2(2-F,4-Cl)	201-203
3-143	Q-3(4-F)	G-2(2-F,6-Cl)	189-191
3-144	Q-3(4-F)	G-2(2-F,4-F,6-F)	181-183
3-145	Q-3(4-F)	G-2(3-F,4-Cl)	194-196
3-146	Q-3(4-F)	G-2(3-Br,4-F)	199-201
3-147	Q-3(4-F)	G-7(4-Cl,6-Cl)	192-194
3-148	Q-3(4-F)	G-7(4-CF ₃ ,6-Cl)	177-179
3-149	Q-3(4-F)	G-1(4-CF ₃)	197-199
3-150	Q-3(4-CH ₃)	G-3	>300
3-151	Q-3(4-CH ₃)	G-1	238-240
3-152	Q-3(4-CH ₃)	G-7	203-205
3-153	Q-3(4-F)	G-7(5-CH ₃)	194-196
3-154	Q-12a	G-2(2-F,4-F)	92-94
3-155	Q-3(4-Cl)	G-2(2-F,4-F)	206-208
3-156	Q-2(4-F)	G-2(2-F,4-F)	216-218
3-157	Q-1(2-F,4-F)	G-2(2-F,4-F)	221-223
3-158	Q-3	G-6a(2-Cl)	196-198
3-159	Q-3(4-F)	G-6a(2-Cl,5-CF ₃)	79-81
3-160	Q-3(4-F)	G-6a(5-CF ₃)	79-81
3-161	Q-1(3-F,4-F)	G-2(2-F,4-F)	229-231
3-162	Q-1(4-CN)	G-3(3-CH ₃)	194-196
3-163	Q-3(5-CH ₃)	G-3(3-F)	181-183
3-164	Q-3(4-F)	G-3(3-Br)	181-183
3-165	Q-3(4-CH ₃)	G-3(3-F)	*1
3-166	Q-1(2-F,6-F)	G-3(3-F)	*1
3-167	Q-3(4-CH ₃)	G-17	233-235
3-168	Q-3(4-CH ₃)	G-9	191-193
3-169	Q-3(4-CH ₃)	G-3(3-Cl)	187-189

(continued)

[Formula 57]



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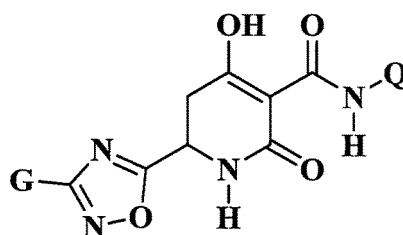
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No.	Q	G	m.p.(°C)
3-170	Q-3	G-6a(2-Cl,5-Cl)	167-169
3-171	Q-9	G-6a(2-Cl,5-Cl)	202-204
3-172	Q-3(4-Cl,6-F)	G-3(3-CH ₃)	174-176
3-173	Q-4(4-Cl)	G-3(3-CH ₃)	206-208
3-174	Q-3(3-CH ₃)	G-2(2-F,4-F)	192-194
3-175	Q-3(5-CH ₃)	G-2(2-F,4-F)	174-176
3-176	Q-3(4-CH ₃)	G-3(3-CH ₃)	117-119
3-177	Q-2	G-2(2-F,4-F)	189-191
3-178	Q-3(4-CH ₃)	G-2(2-F,4-F)	209-211
3-179	Q-3(4-OCH ₃)	G-3(3-F)	201-203
3-180	Q-3(4-Cl)	G-2(3-F)	196-198
3-181	Q-3(4-Cl)	G-3	221-223
3-182	Q-3(4-Cl)	G-7	197-199
3-183	Q-3(4-Cl)	G-3(3-Cl)	169-171
3-184	Q-3	G-2(4-F)	192-194
3-185	Q-3	G-2(3-F)	152-154
3-186	Q-3	G-2(2-F)	162-164
3-187	Q-3	G-3(3-Cl)	177-179
3-188	Q-3(4-F)	G-2(3-NO ₂)	174-176
3-189	Q-3(4-F)	G-2(4-CN)	224-226
3-190	Q-3(4-F)	G-2(3-OCH ₃)	171-173
3-191	Q-3(4-F)	G-2(3-OCF ₃)	164-166
3-192	Q-3(4-F)	G-2(3-CN)	211-213
3-193	Q-3(4-F)	G-2(3-C(O)OCH ₂ CH ₃)	184-186
3-194	Q-3(3-F)	G-3(3-F)	218-220
3-195	Q-3(3-F)	G-3(3-CH ₃)	197-199
3-196	Q-3(3-F)	G-2(2-F,4-F)	207-209
3-197	Q-3(3-F)	G-3(3-Cl)	201-203
3-198	Q-9	G-3(3-CH ₃)	226-228
3-199	Q-3(5-F)	G-2(2-F,4-F)	182-184
3-200	Q-12b	G-3(3-F)	151-153
3-201	Q-12a(4-CH ₃)	G-3(3-F)	214-216
3-202	Q-12a	G-2(4-F)	189-191
3-203	Q-12a	G-2(3-F)	174-176
3-204	Q-12a	G-1(4-F)	169-171
3-205	Q-12a	G-3(3-Cl)	186-188
3-206	Q-12a	G-3(3-CH ₃)	164-166
3-207	Q-12a	G-2(3-F,4-F)	181-183
3-208	Q-12a	G-6a(2-Cl,5-Cl)	*1
3-209	Q-1(4-CN)	G-3(3-Cl)	182-184
3-210	Q-1(4-CN)	G-1(4-F)	235-236

(continued)

[Formula 57]



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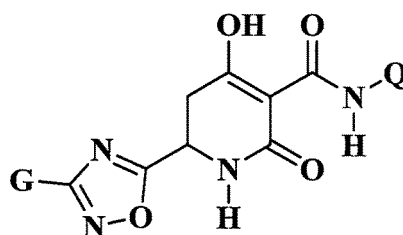
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No.	Q	G	m.p.(°C)
3-211	Q-2(4-Cl)	G-3	222-224
3-212	Q-3(4-F)	G-20	218-220
3-213	Q-2(4-F)	G-3(3-CF ₃)	189-191
3-214	Q-2(4-Cl)	G-3(3-CF ₃)	179-181
3-215	Q-12a	G-3(3-CF ₃)	211-213
3-216	Q-2(4-F)	G-3(3-Cl)	172-174
3-217	Q-2(4-F)	G-3(3-CH ₃)	211-213
3-218	Q-3(4-F)	G-16(3-Cl)	239-241
3-219	Q-3(3-CH ₃)	G-3(3-Cl)	201-203
3-220	Q-3(3-CH ₃)	G-3(3-CH ₃)	192-194
3-221	Q-3(3-CH ₃)	G-1(4-F)	202-204
3-222	Q-3(3-CF ₃)	G-3(3-F)	177-179
3-223	Q-3	G-3(3-CF ₃)	199-201
3-224	Q-1(4-F)	G-3(3-CF ₃)	184-186
3-225	Q-4(4-Cl)	G-3(3-CF ₃)	190-192
3-226	Q-9	G-3(3-CF ₃)	202-204
3-227	Q-3(4-F)	G-28	211-213
3-228	Q-2(4-Cl)	G-3(3-Cl)	187-189
3-229	Q-3(4-Br)	G-3	236-238
3-230	Q-3(4-Br)	G-1	241-243
3-231	Q-3(4-Br)	G-7	217-219
3-232	Q-3(4-Br)	G-3(3-Cl)	191-193
3-233	Q-3(3-Br)	G-1(4-F)	184-186
3-234	Q-3(4-F)	G-9(4-Cl)	209-211
3-235	Q-3(4-F)	G-9(2-Cl)	202-204
3-236	Q-3(5-F)	G-3(3-Cl)	199-201
3-237	Q-3(3-F)	G-1(4-F)	191-193
3-238	Q-3(6-F)	G-3(3-F)	162-164
3-239	Q-3(6-F)	G-3(3-Cl)	176-178
3-240	Q-3(6-F)	G-3(3-CH ₃)	181-183
3-241	Q-3(6-F)	G-1(4-F)	196-198
3-242	Q-12a(4-Br)	G-3(3-F)	229-231
3-243	Q-12a(4-CF ₃)	G-3(3-F)	206-208
3-244	Q-3(4-F)	G-15(4-CF ₃)	215-217
3-245	Q-9	G-3(3-Cl)	246-248
3-246	Q-9	G-3(3-F)	255-257
3-247	Q-9	G-1(4-F)	220-221
3-248	Q-1(2-F,3-Cl)	G-3(3-F)	241-243
3-249	Q-3(3-OCH ₃)	G-3(3-F)	187-189
3-250	Q-3(3-C(O)OCH ₃)	G-3(3-F)	201-203
3-251	Q-12a(4-Br)	G-3(3-CH ₃)	212-214

(continued)

[Formula 57]

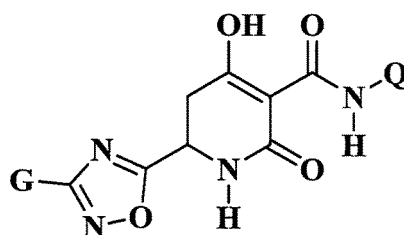


No.	Q	G	m.p.(°C)
3-252	Q-12a(4-Br)	G-1(4-F)	219-221
3-253	Q-3(4-F)	G-40	177-179
3-254	Q-3(4-F)	G-28(4-Cl,5-Cl)	184-186
3-255	Q-3(4-F)	G-11(3-Cl)	184-186
3-256	Q-3(4-F)	G-11(6-Cl)	191-193
3-257	Q-4	G-1(4-F)	162-164
3-258	Q-4	G-3(3-Cl)	197-199
3-259	Q-4	G-3(3-CH ₃)	226-228
3-260	Q-4	G-3(3-CF ₃)	204-206
3-261	Q-4	G-7(4-F)	201-203
3-262	Q-4	G-28(4-Cl,5-Cl)	194-195
3-263	Q-3	G-28(4-Cl,5-Cl)	211-213
3-264	Q-3(4-F)	G-16(3-CF ₃)	206-208
3-265	Q-3(4-F)	G-27	203-206
3-266	Q-1(2-CH ₃ ,4-CH ₃)	G-3(3-F)	217-219
3-267	Q-1(3-Cl,4-CH ₃)	G-3(3-F)	203-205
3-268	Q-4(4-Cl)	G-3(3-Cl)	148-150
3-269	Q-4(4-Cl)	G-1(4-F)	187-189
3-270	Q-3(4-Cl,6-F)	G-3(3-Cl)	143-145
3-271	Q-3(4-Cl,6-F)	G-1(4-F)	170-172
3-272	Q-1(3-F,4-F)	G-3(3-Cl)	189-191
3-273	Q-1(3-F,4-F)	G-3(3-CH ₃)	110-112
3-274	Q-1(3-F,4-F)	G-1(4-F)	122-124
3-275	Q-12a(4-CF ₃)	G-3(3-CH ₃)	119-121
3-276	Q-12a(4-CF ₃)	G-1(4-F)	164-166
3-277	Q-3(4-F)	G-3(3-SCH ₃)	201-203
3-278	Q-3(4-F)	G-3(3-S(O)CH ₃)	179-181
3-279	Q-3(4-F)	G-3(3-S(O) ₂ CH ₃)	209-211
3-280	Q-4(4-CH ₃)	G-3(3-F)	149-151
3-281	Q-3(3-F)	G-3(3-CF ₃)	130-132
3-282	Q-3(5-F)	G-3(3-CF ₃)	136-139
3-283	Q-3(3-CH ₃)	G-3(3-CF ₃)	164-166
3-284	Q-3(4-CH ₃)	G-3(3-CF ₃)	151-153
3-285	Q-3(6-F)	G-3(3-CF ₃)	61-63
3-286	Q-3	G-3(3-CH ₃)	161-163
3-287	Q-9(3-CH ₃)	G-3(3-F)	144-146
3-288	Q-9(3-CH ₃)	G-3(3-Cl)	140-142
3-289	Q-9(3-CH ₃)	G-3(3-CH ₃)	156-158
3-290	Q-9(3-CH ₃)	G-1(4-F)	158-160
3-291	Q-29(3-CH ₂ CH ₃)	G-3(3-F)	136-138
3-292	Q-3(4-Cl,6-F)	G-3(3-CF ₃)	88-91

EP 4 582 413 A1

(continued)

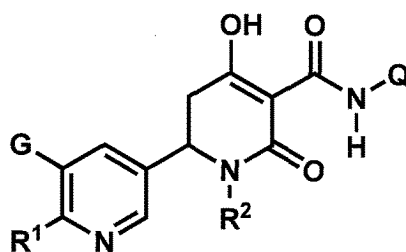
[Formula 57]



No.	Q	G	m.p.(°C)
3-293	Q-3(4-F)	G-18	198-200
3-294	Q-10(3-CH ₃)	G-3(3-F)	204-206

[Table 10]

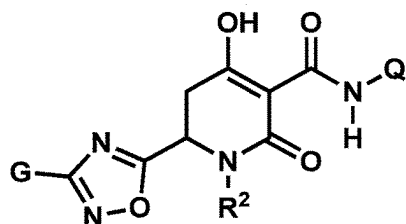
[Formula 58]



No.	R¹	Q	G	R²	m.p.(°C)
4-001	Cl	Q-3(4-F)	G-1(4-F)	C(O)OCH ₂ CH ₃	117-119

[Table 11]

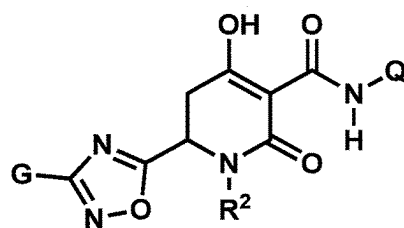
[Formula 59]



No.	Q	G	R²	m.p.(°C)
5-001	Q-3(4-F)	G-3(3-F)	C(O)OCH ₂ CH ₃	*1
5-002	Q-3(4-F)	G-3(3-F)	C(O)i-Bu	*1
5-003	Q-3(4-F)	G-3(3-F)	C(O)c-Pr	121-123
5-004	Q-3(4-F)	G-3(3-F)	C(O)CH ₂ OCH ₃	*1
5-005	Q-3(4-F)	G-3(3-F)	C(O)OCH ₃	*1
5-006	Q-3(4-F)	G-3(3-F)	C(O)C(O)CH ₂ CH ₃	137-139
5-007	Q-3(4-F)	G-3(3-F)	C(O)OCH ₂ CH=CH ₂	148-150
5-008	Q-3(4-F)	G-3(3-F)	C(O)CH ₃	190-192
5-009	Q-3(4-F)	G-3(3-F)	C(O)CH ₂ CF ₃	204-206
5-010	Q-2(4-F)	G-3(3-F)	C(O)OCH ₃	83-85
5-011	Q-2(4-F)	G-3(3-F)	C(O)CH ₂ OCH ₃	86-88

(continued)

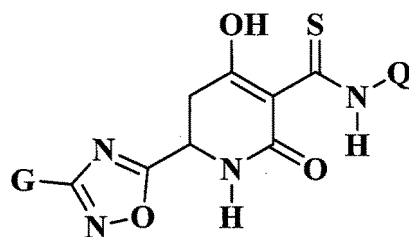
[Formula 59]



No.	Q	G	R ²	m.p.(°C)
5-012	Q-2(4-F)	G-3(3-F)	C(O)CH ₃	*1
5-013	Q-3(4-F)	G-3(3-F)	D-1(2-CH ₃)	188-191
5-014	Q-3(4-F)	G-3(3-F)	D-2	*1
5-015	Q-3(4-F)	G-3(3-F)	D-3	*1
5-016	Q-2(4-F)	G-3(3-F)	D-3	113-115

[Table 12]

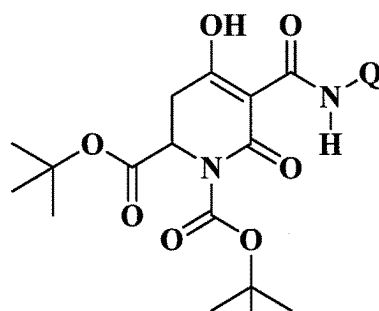
[Formula 60]



No.	Q	G	m.p.(°C)
6-001	Q-2(4-Cl)	G-3(3-F)	196-198
6-002	Q-3(4-F)	G-3(3-F)	200-202
6-003	Q-3(4-F)	G-2(4-F)	181-182
6-004	Q-3(4-F)	G-2(2-F,4-F)	169-172
6-005	Q-3(4-F)	G-3(3-CH ₃)	191-192

[Table 13]

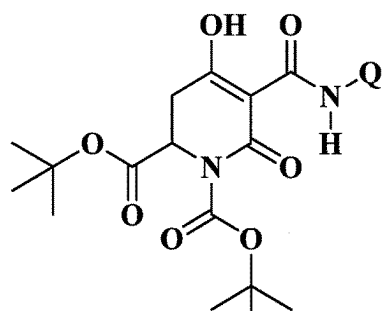
[Formula 61]



No.	Q	m.p.(°C)
i1-001	Q-1	
i1-002	Q-1(4-F)	151-153
i1-003	Q-1(4-Cl)	
i1-004	Q-1(4-Br)	

(continued)

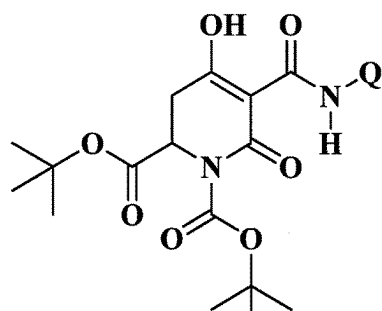
[Formula 61]



No.	Q	m.p.(°C)
i1-005	Q-1(4-I)	
i1-006	Q-1(4-CN)	161-163
i1-007	Q-1(4-CH ₃)	
i1-008	Q-1(4-CF ₃)	
i1-009	Q-2	
i1-010	Q-2(4-F)	144-146
i1-011	Q-2(4-Cl)	172-174
i1-012	Q-2(4-Br)	
i1-013	Q-2(4-I)	
i1-014	Q-2(4-CN)	
i1-015	Q-2(4-CH ₃)	
i1-016	Q-2(4-CF ₃)	
i1-017	Q-3	154-156
i1-018	Q-3(4-F)	152-154
i1-019	Q-3(4-Cl)	182-184
i1-020	Q-3(4-Br)	186-188
i1-021	Q-3(4-I)	
i1-022	Q-3(4-CN)	
i1-023	Q-3(4-CH ₃)	167-169
i1-024	Q-3(4-CF ₃)	
i1-025	Q-4	146-148
i1-026	Q-4(4-F)	
i1-027	Q-4(4-Cl)	174-176
i1-028	Q-4(4-Br)	164-166
i1-029	Q-4(4-I)	
i1-030	Q-4(4-CN)	
i1-031	Q-4(4-CH ₃)	
i1-032	Q-4(4-CF ₃)	
i1-033	Q-6	
i1-034	Q-6(4-F)	
i1-035	Q-6(4-Cl)	154-156
i1-036	Q-6(4-Br)	
i1-037	Q-6(4-I)	
i1-038	Q-6(4-CN)	
i1-039	Q-6(4-CH ₃)	
i1-040	Q-6(4-CF ₃)	
i1-041	Q-9	182-184
i1-042	Q-9(4-F)	
i1-043	Q-9(4-Cl)	186-188

(continued)

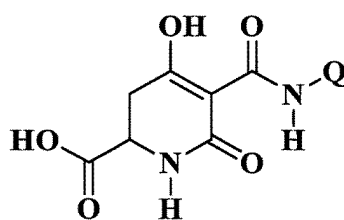
[Formula 61]



No.	Q	m.p.(°C)
i1-044	Q-9(4-Br)	166-168
i1-045	Q-9(4-I)	
i1-046	Q-9(4-CN)	
i1-047	Q-9(4-CH ₃)	
i1-048	Q-9(4-CF ₃)	

[Table 14]

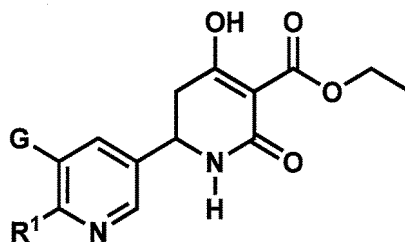
[Formula 62]



No.	Q	m.p.(°C)
i2-002	Q-1(4-F)	205-207
i2-006	Q-1(4-CN)	246-248
i2-010	Q-2(4-F)	186-188
i2-011	Q-2(4-Cl)	243-245
i2-017	Q-3	171-173
i2-018	Q-3(4-F)	211-213
i2-019	Q-3(4-Cl)	199-201
i2-020	Q-3(4-Br)	191-193
i2-023	Q-3(4-CH ₃)	174-176
i2-025	Q-4	224-226
i2-027	Q-4(4-Cl)	222-224
i2-041	Q-9	206-208

[Table 15]

[Formula 63]



No.	R1	G	m.p.(°C)
i5-003	Cl	G-3	181-183
i5-004	Cl	G-2	162-164
i5-010	Cl	G-1(4-F)	178-180
i5-014	Cl	G-3(3-F)	184-186
i5-017	Cl	G-2(4-F)	159-161
i5-029	Cl	G-3(3-Cl)	174-176
i5-040	Cl	G-1(4-CH ₃)	196-198
i5-044	Cl	G-3(3-CH ₃)	182-184
i5-078	CF ₃	G-3(3-F)	159-161

[0224] Table 16 shows ¹H-NMR data for compounds as the presently invented compound for which melting point is not shown. Chemical shift values in proton nuclear magnetic resonance spectra (hereinafter, referred to as ¹H-NMR) shown below were determined with use of Me₄Si (tetramethylsilane) as a standard substance at 300 MHz (model: JNM-ECX300 or JNM-ECP300, manufactured by JEOL Ltd.) or 400 MHz (model: JNM-ECZ400S, manufactured by JEOL Ltd.). Signs for chemical shift values in ¹H-NMR have meanings shown below, and the notation "*"2" indicates that any signal corresponding to a proton of OH or NH was not observed.

s: singlet, d: doublet, dd: double doublet, t: triplet, q: quartet, m: multiplet, brs: broad singlet

[Table 16]

No.	¹ H-NMR (Me ₄ Si)
2-286 (400MHz, DMSO-d ₆ , *2):	δ12.4(brs, 1H), 8.50(brs, 1H), 8.40(brs, 1H), 8.25-8.15(m, 1H), 8.10-8.00(m, 1H), 7.92(brs, 1H), 7.40-7.30(m, 2H), 7.20-7.10(m, 1H), 5.15-4.90(m, 2H), 2.60-3.1(m, 1H).
2-287 (400MHz, DMSO-d ₆):	δ12.1 and 11.9(brs, 1H), 8.7-8.8(m, 2H), 8.5-8.6(brs, 1H), 8.4-8.5(m, 1H), 8.3-8.4(m, 1H), 8.2-8.3(m, 1H), 8.05-8.15(m, 1H), 7.95-8.05(m, 1H), 7.35-7.45(m, 2H), 4.9-5.1(m, 1H), 2.8-3.2(m, 2H).
2-288 (400MHz, DMSO-d ₆):	δ12.4(brs, 1H), 8.9-9.0(m, 1H), 8.7-8.9(brs, 1H), 8.5-8.6(m, 1H), 8.4(brs, 2H), 8.15-8.3(m, 1H), 8.05-8.15(m, 1H), 7.5-7.7(m, 2H), 7.3-7.4(m, 1H), 4.85-4.95(m, 1H), 2.8-3.0(m, 2H).
2-289 (400MHz, DMSO-d ₆ , *2):	δ9.68(brs, 1H), 9.02(brs, 1H), 8.5-8.6(m, 2H), 8.4-8.5(m, 1H), 8.2-8.35(m, 2H), 8.1(brs, 1H), 7.7-7.8(m, 1H), 7.35-7.45(m, 1H), 5.05(brs, 1H), 2.8-3.2(m, 2H).
3-165 (400MHz, CDCl ₃):	δ12.1(brs, 1H), 8.77(brs, 1H), 8.47(d, J=4.8Hz, 1H), 8.17(brs, 1H), 7.8-7.95(m, 1H), 7.6-7.7(m, 2H), 7.0-7.15(m, 1H), 5.25-5.55(m, 1H), 3.0-3.1(m, 2H), 2.07(s, 3H).
3-166 (400MHz, CDCl ₃):	δ10.9(brs, 1H), 8.35-8.5(m, 2H), 7.8-7.95(m, 2H), 7.6-7.7(m, 2H), 6.9-7.1(m, 1H), 5.1-5.2(m, 1H), 3.0-3.3(m, 2H).
3-208 (300MHz, DMSO-d ₆ , *2):	11.90-12.06(m, 1H), 9.63-8.68(m, 1H), 7.67(brs, 1H), 6.39-6.52(m, 1H), 5.23-5.55(m, 1H), 3.91(s, 3H), 3.80(s, 3H), 3.56(dd, J=17.7, 7.5Hz, 1H), 2.86-3.15(m, 1H).
5-001 (400MHz, CDCl ₃ , *2):	δ11.7(brs, 1H), 8.37(d, J=5.2Hz, 1H), 8.23(d, J=3.2Hz, 1H), 8.04(dd, J=13.2, 4.0Hz, 1H), 7.8-7.85(m, 1H), 7.57(brs, 1H), 7.4-7.5(m, 1H), 6.0-6.1(m, 1H), 4.46(q, J=7.2Hz, 2H), 3.45-3.55(m, 1H), 3.25-3.35(m, 1H), 1.43(t, J=7.2Hz, 3H).
5-002 (400MHz, CDCl ₃ , *2):	δ11.7(brs, 1H), 8.36(d, J=5.2Hz, 1H), 8.25(d, J=3.2Hz, 1H), 8.08(dd, J=9.2, 4.0Hz, 1H), 7.75-7.85(m, 1H), 7.55(brs, 1H), 7.4-7.5(m, 1H), 6.3-6.4(m, 1H), 3.39(d, J=4.4Hz, 2H), 3.1-3.2(m, 1H), 2.8-2.9(m, 1H), 2.15-2.25(m, 1H), 1.06(d, J=6.8Hz, 3H), 1.0(d, J=6.8Hz, 3H).

(continued)

No.	¹ H-NMR (Me ₄ Si)
5	5-004 (400MHz, CDCl ₃ , *2):δ11.5(brs, 1H), 8.37(d, J=5.2Hz, 1H), 8.25(d, J=2.8Hz, 1H), 8.07(dd, J=9.2, 4.0Hz, 1H), 7.75-7.85(m, 1H), 7.55(brs, 1H), 7.4-7.5(m, 1H), 6.4-6.45(m, 1H), 4.92(d, J=18Hz, 1H), 4.66(d, J=18Hz, 1H), 3.54(s, 3H), 3.43(d, J=4.4Hz, 2H).
10	5-005 (400MHz, CDCl ₃ , *2):δ11.7(brs, 1H), 8.37(d, J=5.2Hz, 1H), 8.21(d, J=2.4Hz, 1H), 8.0-8.1(m, 1H), 7.8-7.85(m, 1H), 7.55-7.65(m, 1H), 7.4-7.5(m, 1H), 6.06(dd, J=6.4, 1.6Hz, 1H), 4.02(s, 3H), 3.4-3.55(m, 1H), 3.3-3.4(m, 1H).
15	5-012 (400MHz, CDCl ₃ , *2):δ11.4(brs, 1H), 8.35-8.45(m, 2H), 8.05-8.15(m, 1H), 7.8-7.85(m, 1H), 7.55-7.6(m, 1H), 6.9-7.0(m, 1H), 6.3-6.4(m, 1H), 3.41(d, J=4.0Hz, 2H), 2.73(s, 3H).
20	5-014 (400MHz, CDCl ₃ , *2):δ11.5(brs, 1H), 8.37(d, J=5.2Hz, 1H), 8.25(d, J=2.8Hz, 1H), 8.07(dd, J=9.2, 4.0Hz, 1H), 7.75-7.85(m, 1H), 7.55(brs, 1H), 7.4-7.5(m, 1H), 6.4-6.45(m, 1H), 3.65-3.75(m, 4H), 3.25-3.3(m, 4H), 2.8-2.9(m, 1H), 2.0-2.2(m, 1H).
25	5-015 (400MHz, CDCl ₃ , *2):δ11.6(brs, 1H), 8.36(d, J=5.2Hz, 1H), 8.21(d, J=3.2Hz, 1H), 8.06(dd, J=9.2, 4.0Hz, 1H), 7.75-7.85(m, 1H), 7.55-7.65(m, 2H), 7.4-7.5(m, 1H), 7.3-7.35(m, 1H), 6.55-6.6(m, 1H), 5.8-5.85(m, 1H), 3.61(dd, J=18.0, 7.2Hz, 1H), 3.3-3.45(m, 1H).

[Test Examples]

[0225] Next, the usefulness of the presently invented compound as a pesticide will be specifically described in Test Examples shown in the following, but the present invention is not limited thereto.

Test Example 1: Insecticidal test for brown rice planthoppers

[0226] A 10% by mass emulsion of the presently invented compound prepared according to the above formulation example for an emulsion was diluted with water containing a spreader to prepare a chemical solution having a concentration of 500 ppm. Rice leaf sheaths were soaked in the chemical solution for approximately 10 seconds. After the completion of the soaking operation, the rice leaf sheaths treated with the chemical solution were air-dried, and then put in test tubes. Into each test tube, five third-instar brown rice planthoppers (*Nilaparvata lugens*) larvae were released, and the test tubes were capped with sponge and accommodated in a thermostatic room at 25°C. Six days after the accommodation, the number of dead brown rice planthoppers individuals in the test tubes were examined, and the death rate was calculated from a calculation formula shown below. The test was carried out in duplicate.

Death rate (%) = (number of dead individuals / number of tested individuals) × 100

[0227] The result showed that the following compounds exhibited death rates of 90% or more.

The presently invented compound: 1-001, 1-002, 1-003, 1-013, 1-014, 1-020, 2-001, 2-005, 2-008, 2-009, 2-010, 2-011, 2-012, 2-013, 2-014, 2-016, 2-018, 2-019, 2-020, 2-021, 2-022, 2-023, 2-024, 2-025, 2-027, 2-028, 2-029, 2-030, 2-031, 2-032, 2-033, 2-034, 2-035, 2-036, 2-037, 2-038, 2-039, 2-040, 2-041, 2-042, 2-043, 2-044, 2-045, 2-047, 2-048, 2-049, 2-050, 2-051, 2-052, 2-053, 2-054, 2-055, 2-056, 2-057, 2-058, 2-059, 2-060, 2-061, 2-062, 2-063, 2-067, 2-069, 2-071, 2-074, 2-076, 2-077, 2-079, 2-080, 2-081, 2-082, 2-083, 2-084, 2-085, 2-086, 2-087, 2-088, 2-089, 2-090, 2-091, 2-092, 2-093, 2-094, 2-095, 2-096, 2-097, 2-098, 2-099, 2-100, 2-101, 2-102, 2-103, 2-104, 2-105, 2-106, 2-107, 2-108, 2-109, 2-110, 2-111, 2-112, 2-113, 2-114, 2-115, 2-116, 2-117, 2-118, 2-119, 2-120, 2-122, 2-123, 2-124, 2-125, 2-126, 2-127, 2-128, 2-129, 2-130, 2-132, 2-133, 2-134, 2-135, 2-136, 2-137, 2-138, 2-139, 2-140, 2-141, 2-142, 2-143, 2-144, 2-145, 2-146, 2-147, 2-150, 2-151, 2-152, 2-153, 2-154, 2-155, 2-156, 2-157, 2-158, 2-159, 2-160, 2-161, 2-162, 2-163, 2-164, 2-165, 2-166, 2-167, 2-168, 2-169, 2-170, 2-171, 2-172, 2-173, 2-174, 2-175, 2-176, 2-177, 2-178, 2-179, 2-180, 2-181, 2-182, 2-183, 2-184, 2-186, 2-187, 2-188, 2-189, 2-190, 2-191, 2-192, 2-193, 2-194, 2-195, 2-196, 2-197, 2-198, 2-199, 2-200, 2-201, 2-202, 2-203, 2-204, 2-205, 2-206, 2-207, 2-208, 2-209, 2-211, 2-212, 2-213, 2-214, 2-215, 2-216, 2-217, 2-218, 2-219, 2-222, 2-223, 2-227, 2-228, 2-231, 2-232, 2-233, 2-235, 2-238, 2-240, 2-244, 2-245, 2-246, 2-247, 2-248, 2-249, 2-250, 2-251, 2-252, 2-253, 2-254, 2-255, 2-256, 2-259, 2-260, 2-261, 2-262, 2-263, 2-264, 2-265, 2-267, 2-268, 2-269, 2-271, 2-272, 2-273, 2-276, 2-277, 2-287, 2-288, 2-289, 2-290, 2-297, 2-298, 2-299, 2-300, 2-301, 2-302, 2-303, 2-304, 2-305, 3-001, 3-002, 3-005, 3-006, 3-007, 3-009, 3-010, 3-011, 3-012, 3-013, 3-014, 3-015, 3-016, 3-017, 3-018, 3-020, 3-021, 3-022, 3-023, 3-024, 3-025, 3-026, 3-027, 3-028, 3-029, 3-030, 3-031, 3-032, 3-033, 3-034, 3-035, 3-036, 3-037, 3-038, 3-039, 3-040, 3-041, 3-042, 3-043, 3-044, 3-045, 3-046, 3-047, 3-048, 3-049, 3-050, 3-051, 3-052, 3-053, 3-055, 3-056, 3-057, 3-058, 3-059, 3-060, 3-061, 3-062, 3-063, 3-064, 3-065, 3-066, 3-067, 3-068, 3-069, 3-070, 3-071, 3-072, 3-073, 3-074, 3-075, 3-076, 3-077, 3-078, 3-079, 3-080, 3-081, 3-082, 3-083, 3-084, 3-085, 3-086, 3-087, 3-088,

3-089, 3-090, 3-091, 3-092, 3-093, 3-094, 3-095, 3-096, 3-097, 3-098, 3-100, 3-102, 3-103, 3-104, 3-105, 3-106, 3-107, 3-108, 3-110, 3-111, 3-112, 3-113, 3-114, 3-115, 3-116, 3-119, 3-121, 3-122, 3-123, 3-126, 3-127, 3-129, 3-130, 3-131, 3-132, 3-133, 3-134, 3-135, 3-136, 3-138, 3-139, 3-140, 3-141, 3-144, 3-146, 3-147, 3-152, 3-153, 3-154, 3-155, 3-156, 3-157, 3-158, 3-159, 3-160, 3-161, 3-162, 3-163, 3-164, 3-165, 3-166, 3-168, 3-169, 3-170, 3-171, 3-172, 3-173, 3-174, 3-175, 3-176, 3-177, 3-178, 3-179, 3-180, 3-182, 3-183, 3-184, 3-185, 3-186, 3-187, 3-188, 3-189, 3-190, 3-191, 3-192, 3-193, 3-194, 3-195, 3-196, 3-197, 3-198, 3-199, 3-200, 3-201, 3-202, 3-203, 3-204, 3-205, 3-206, 3-207, 3-208, 3-209, 3-210, 3-213, 3-214, 3-215, 3-216, 3-217, 3-219, 3-220, 3-221, 3-223, 3-224, 3-225, 3-226, 3-227, 3-228, 3-232, 3-233, 3-234, 3-235, 3-236, 3-237, 3-238, 3-239, 3-240, 3-241, 3-242, 3-243, 3-244, 3-245, 3-246, 3-249, 3-250, 3-251, 3-252, 3-253, 3-254, 3-255, 3-256, 3-257, 3-258, 3-259, 3-260, 3-261, 3-262, 3-263, 3-264, 3-265, 3-268, 3-269, 3-270, 3-271, 3-272, 3-273, 3-274, 3-275, 3-276, 3-277, 3-278, 3-279, 3-280, 3-281, 3-283, 3-284, 3-285, 3-286, 3-287, 3-288, 3-289, 3-290, 3-291, 3-292, 3-293, 3-294, 4-001, 5-001, 5-002, 5-003, 5-004, 5-005, 5-006, 5-007, 5-008, 5-009, 5-010, 5-011, 5-012, 5-013, 5-014, 5-015, 5-016, 6-001, 6-002, 6-003, 6-004, 6-005

Test Example 2: Insecticidal test for green peach aphids

[0228] Wet absorbent cotton was laid on each glass dish having an inner diameter of 3 cm, a Chinese olive leaf cut into a circle having a diameter of 3 cm was placed thereon, and four wingless green peach aphids (*Myzus persicae*) imagoes were released. After a day, a 10% by mass emulsion of the presently invented compound prepared according to the above formulation example for an emulsion was diluted with water containing a spreader to prepare a chemical solution having a concentration of 500 ppm. The chemical solution prepared was sprinkled (2.5 mg/cm²) with a rotary tower sprinkler, and the dishes were capped and accommodated in a thermostatic room at 25°C. Six days after the accommodation, the number of dead green peach aphids individuals in the dishes were examined, and the death rate was calculated from the same calculation formula as in Test Example 1. The test was carried out in duplicate.

[0229] The result showed that the following compounds exhibited death rates of 90% or more.

The presently invented compound: 1-001, 1-004, 1-005, 1-006, 1-007, 1-008, 1-009, 1-010, 1-011, 1-012, 1-014, 1-015, 1-016, 1-017, 1-019, 1-020, 1-021, 1-023, 2-003, 2-005, 2-007, 2-010, 2-023, 2-032, 2-034, 2-035, 2-036, 2-040, 2-041, 2-042, 2-044, 2-045, 2-046, 2-047, 2-048, 2-049, 2-053, 2-054, 2-056, 2-057, 2-058, 2-062, 2-063, 2-064, 2-067, 2-068, 2-077, 2-083, 2-086, 2-087, 2-091, 2-097, 2-098, 2-099, 2-100, 2-104, 2-112, 2-115, 2-117, 2-120, 2-124, 2-125, 2-126, 2-137, 2-141, 2-146, 2-151, 2-155, 2-156, 2-157, 2-158, 2-159, 2-160, 2-161, 2-162, 2-163, 2-165, 2-167, 2-169, 2-170, 2-172, 2-173, 2-179, 2-180, 2-182, 2-183, 2-184, 2-186, 2-189, 2-192, 2-194, 2-196, 2-197, 2-198, 2-199, 2-200, 2-201, 2-202, 2-203, 2-208, 2-213, 2-214, 2-216, 2-217, 2-219, 2-242, 2-244, 2-245, 2-247, 2-250, 2-251, 2-253, 2-254, 2-255, 2-257, 2-264, 2-265, 2-266, 2-267, 2-268, 2-271, 2-273, 2-274, 2-278, 2-280, 2-281, 2-284, 2-285, 2-292, 2-298, 2-303, 3-002, 3-009, 3-011, 3-013, 3-014, 3-015, 3-017, 3-020, 3-022, 3-024, 3-027, 3-028, 3-033, 3-039, 3-042, 3-044, 3-049, 3-051, 3-053, 3-054, 3-055, 3-056, 3-058, 3-059, 3-060, 3-064, 3-070, 3-072, 3-074, 3-075, 3-080, 3-095, 3-096, 3-097, 3-098, 3-099, 3-100, 3-107, 3-109, 3-110, 3-111, 3-112, 3-117, 3-118, 3-119, 3-122, 3-123, 3-125, 3-126, 3-128, 3-129, 3-131, 3-132, 3-133, 3-134, 3-136, 3-137, 3-139, 3-142, 3-144, 3-148, 3-164, 3-166, 3-167, 3-170, 3-173, 3-174, 3-178, 3-179, 3-181, 3-183, 3-192, 3-194, 3-196, 3-200, 3-202, 3-204, 3-205, 3-206, 3-207, 3-208, 3-210, 3-213, 3-215, 3-217, 3-219, 3-222, 3-224, 3-225, 3-226, 3-228, 3-229, 3-230, 3-232, 3-236, 3-241, 3-246, 3-248, 3-249, 3-251, 3-252, 3-253, 3-254, 3-257, 3-265, 3-266, 3-268, 3-269, 3-270, 3-271, 3-272, 3-273, 3-274, 3-275, 3-276, 3-277, 3-278, 3-279, 3-280, 3-281, 3-291, 4-001, 5-002, 5-007, 5-009, 5-011, 5-012, 5-013, 5-015, 5-016, 6-001, 6-004

Test Example 3: Insecticidal activity against western flower thrips

[0230] Wet filter paper was laid on each styrol cup having an inner diameter of 7 cm, and a common bean leaf cut into a 3 cm square was placed thereon, and inoculated with 20 western flower thrips (*Frankliniella occidentalis*) larvae. A 10% by mass emulsion of the presently invented compound prepared according to the above formulation example for an emulsion was diluted with water containing a spreader to prepare a chemical solution having a concentration of 500 ppm. For each styrol cup, 2.5 ml of the chemical solution prepared was sprinkled (2.5 mg/cm²) with a rotary tower sprinkler. After 2 days, the number of dead western flower thrips individuals in the styrol cups were examined, and the death rate was calculated from the same calculation formula as in Test Example 1. The test was carried out in duplicate.

[0231] The result showed that the following compounds exhibited death rates of 90% or more.

The presently invented compound: 1-001, 1-002, 1-003, 1-005, 1-007, 1-008, 1-009, 1-010, 1-011, 1-013, 1-014, 1-015, 1-016, 1-017, 1-019, 1-020, 1-022, 1-023, 1-024, 2-001, 2-005, 2-008, 2-009, 2-010, 2-011, 2-012, 2-013, 2-014, 2-016, 2-018, 2-019, 2-020, 2-021, 2-022, 2-024, 2-025, 2-027, 2-028, 2-029, 2-030, 2-031, 2-032, 2-033, 2-034, 2-035, 2-036, 2-037, 2-038, 2-039, 2-040, 2-041, 2-042, 2-044, 2-045, 2-047, 2-048, 2-049, 2-050, 2-053, 2-054, 2-055, 2-056, 2-057, 2-058, 2-059, 2-062, 2-063, 2-067, 2-068, 2-069, 2-071, 2-072, 2-073, 2-074, 2-076, 2-077, 2-078, 2-079, 2-080, 2-081, 2-082, 2-083, 2-084, 2-085, 2-086, 2-087, 2-088, 2-089, 2-090, 2-091, 2-092, 2-093, 2-094, 2-095, 2-096, 2-099, 2-100, 2-101, 2-102, 2-103, 2-104, 2-105, 2-106, 2-107, 2-108, 2-109, 2-110, 2-111, 2-112, 2-113, 2-114, 2-115, 2-116, 2-117,

2-118, 2-119, 2-120, 2-121, 2-122, 2-123, 2-124, 2-125, 2-126, 2-127, 2-128, 2-129, 2-130, 2-131, 2-132, 2-133, 2-134, 2-135, 2-136, 2-137, 2-138, 2-139, 2-140, 2-141, 2-142, 2-143, 2-144, 2-145, 2-146, 2-147, 2-150, 2-151, 2-152, 2-153, 2-154, 2-155, 2-156, 2-157, 2-158, 2-159, 2-160, 2-161, 2-162, 2-163, 2-164, 2-165, 2-166, 2-167, 2-168, 2-169, 2-170, 2-171, 2-172, 2-173, 2-174, 2-175, 2-176, 2-177, 2-178, 2-179, 2-180, 2-181, 2-182, 2-183, 2-184, 2-186, 2-187, 2-188, 2-189, 2-190, 2-191, 2-192, 2-193, 2-194, 2-195, 2-196, 2-198, 2-199, 2-200, 2-201, 2-202, 2-203, 2-204, 2-206, 2-207, 2-208, 2-209, 2-211, 2-212, 2-213, 2-214, 2-215, 2-216, 2-218, 2-219, 2-220, 2-221, 2-222, 2-223, 2-224, 2-225, 2-226, 2-227, 2-228, 2-229, 2-230, 2-231, 2-232, 2-233, 2-235, 2-238, 2-239, 2-240, 2-244, 2-245, 2-246, 2-247, 2-248, 2-249, 2-250, 2-251, 2-252, 2-253, 2-254, 2-255, 2-256, 2-257, 2-258, 2-259, 2-260, 2-261, 2-262, 2-263, 2-265, 2-269, 2-271, 2-272, 2-273, 2-276, 2-277, 2-279, 2-280, 2-281, 2-282, 2-287, 2-288, 2-296, 2-297, 2-298, 2-299, 2-300, 2-301, 2-302, 2-303, 2-304, 2-305, 3-001, 3-003, 3-005, 3-006, 3-007, 3-009, 3-010, 3-011, 3-012, 3-013, 3-014, 3-015, 3-016, 3-018, 3-020, 3-021, 3-022, 3-023, 3-024, 3-025, 3-026, 3-027, 3-028, 3-029, 3-030, 3-031, 3-032, 3-034, 3-035, 3-036, 3-037, 3-038, 3-039, 3-040, 3-041, 3-042, 3-043, 3-044, 3-045, 3-046, 3-047, 3-048, 3-049, 3-050, 3-051, 3-052, 3-054, 3-055, 3-056, 3-057, 3-058, 3-059, 3-060, 3-061, 3-062, 3-063, 3-064, 3-065, 3-066, 3-067, 3-068, 3-069, 3-070, 3-071, 3-072, 3-073, 3-074, 3-075, 3-076, 3-077, 3-078, 3-079, 3-080, 3-081, 3-082, 3-083, 3-084, 3-085, 3-086, 3-088, 3-089, 3-090, 3-091, 3-092, 3-095, 3-096, 3-097, 3-098, 3-100, 3-102, 3-103, 3-104, 3-105, 3-106, 3-107, 3-108, 3-109, 3-111, 3-113, 3-114, 3-115, 3-116, 3-120, 3-121, 3-122, 3-123, 3-124, 3-126, 3-127, 3-128, 3-129, 3-131, 3-132, 3-133, 3-134, 3-135, 3-138, 3-139, 3-140, 3-141, 3-144, 3-145, 3-146, 3-147, 3-154, 3-155, 3-156, 3-157, 3-159, 3-160, 3-161, 3-163, 3-164, 3-165, 3-169, 3-170, 3-171, 3-172, 3-173, 3-174, 3-175, 3-176, 3-177, 3-179, 3-180, 3-183, 3-184, 3-185, 3-186, 3-187, 3-188, 3-189, 3-190, 3-191, 3-192, 3-195, 3-197, 3-199, 3-200, 3-202, 3-204, 3-205, 3-206, 3-207, 3-208, 3-209, 3-210, 3-213, 3-214, 3-215, 3-216, 3-217, 3-219, 3-220, 3-221, 3-223, 3-224, 3-225, 3-226, 3-227, 3-228, 3-232, 3-233, 3-234, 3-235, 3-236, 3-238, 3-239, 3-240, 3-241, 3-242, 3-243, 3-244, 3-245, 3-246, 3-249, 3-250, 3-252, 3-253, 3-254, 3-255, 3-256, 3-257, 3-258, 3-259, 3-260, 3-261, 3-262, 3-263, 3-264, 3-265, 3-267, 3-268, 3-269, 3-270, 3-271, 3-272, 3-273, 3-274, 3-275, 3-277, 3-278, 3-279, 3-280, 3-281, 3-282, 3-283, 3-284, 3-285, 3-286, 3-287, 3-288, 3-289, 3-292, 3-294, 4-001, 5-001, 5-002, 5-003, 5-004, 5-005, 5-006, 5-007, 5-008, 5-009, 5-010, 5-011, 5-012, 5-013, 5-014, 5-015, 5-016, 6-001, 6-002, 6-003, 6-004

Test Example 4: Insecticidal test for diamondback moths

[0232] A 10% by mass emulsion of the presently invented compound prepared according to the above formulation example for an emulsion was diluted with water containing a spreader to prepare a chemical solution having a concentration of 500 ppm. Chinese olive leaves were soaked in the chemical solution for approximately 10 seconds. After the completion of the soaking operation, the Chinese olive leaves treated with the chemical solution were air-dried, and then put in dishes. Into each dish, five third-instar diamondback moths (*Plutella xylostella*) larvae were released, and the dishes were capped and accommodated in a thermostatic room at 25°C. Six days after the accommodation, the number of dead diamondback moths individuals in the dishes were examined, and the death rate was calculated from the same calculation formula as in Test Example 1. The test was carried out in duplicate.

[0233] The result showed that the following compounds exhibited death rates of 90% or more. The presently invented compound: 1-001, 1-002, 1-003, 1-004, 1-005, 1-006, 1-007, 1-008, 1-009, 1-010, 1-011, 1-013, 1-014, 1-015, 1-016, 1-017, 1-018, 1-019, 1-020, 1-021, 1-022, 1-023, 1-024, 2-001, 2-005, 2-008, 2-009, 2-010, 2-011, 2-012, 2-013, 2-014, 2-016, 2-017, 2-018, 2-019, 2-020, 2-021, 2-022, 2-024, 2-025, 2-027, 2-028, 2-029, 2-030, 2-031, 2-032, 2-033, 2-034, 2-035, 2-036, 2-038, 2-039, 2-040, 2-041, 2-042, 2-044, 2-045, 2-048, 2-049, 2-050, 2-055, 2-057, 2-058, 2-060, 2-061, 2-062, 2-063, 2-064, 2-066, 2-067, 2-068, 2-069, 2-072, 2-073, 2-076, 2-077, 2-078, 2-079, 2-080, 2-081, 2-082, 2-083, 2-084, 2-085, 2-086, 2-087, 2-088, 2-089, 2-090, 2-091, 2-092, 2-093, 2-094, 2-095, 2-096, 2-097, 2-098, 2-099, 2-100, 2-101, 2-102, 2-103, 2-104, 2-105, 2-106, 2-107, 2-108, 2-109, 2-110, 2-111, 2-112, 2-113, 2-114, 2-115, 2-117, 2-118, 2-119, 2-121, 2-122, 2-123, 2-124, 2-125, 2-126, 2-127, 2-128, 2-129, 2-130, 2-131, 2-132, 2-133, 2-134, 2-135, 2-136, 2-137, 2-138, 2-139, 2-140, 2-141, 2-142, 2-143, 2-144, 2-145, 2-146, 2-147, 2-148, 2-150, 2-151, 2-152, 2-153, 2-154, 2-155, 2-156, 2-157, 2-158, 2-159, 2-160, 2-161, 2-162, 2-163, 2-164, 2-166, 2-167, 2-168, 2-169, 2-170, 2-171, 2-172, 2-174, 2-175, 2-176, 2-177, 2-178, 2-179, 2-181, 2-182, 2-183, 2-184, 2-186, 2-187, 2-188, 2-189, 2-190, 2-191, 2-192, 2-193, 2-194, 2-195, 2-196, 2-197, 2-198, 2-199, 2-200, 2-201, 2-202, 2-203, 2-204, 2-205, 2-206, 2-207, 2-208, 2-209, 2-211, 2-212, 2-213, 2-214, 2-215, 2-216, 2-217, 2-218, 2-219, 2-220, 2-221, 2-222, 2-223, 2-224, 2-225, 2-226, 2-227, 2-228, 2-229, 2-231, 2-232, 2-233, 2-234, 2-235, 2-237, 2-240, 2-241, 2-242, 2-243, 2-244, 2-245, 2-246, 2-247, 2-248, 2-249, 2-250, 2-251, 2-252, 2-253, 2-254, 2-255, 2-256, 2-257, 2-259, 2-260, 2-261, 2-262, 2-263, 2-264, 2-265, 2-267, 2-268, 2-269, 2-271, 2-272, 2-273, 2-274, 2-276, 2-277, 2-278, 2-279, 2-280, 2-282, 2-283, 2-287, 2-288, 2-295, 2-297, 2-298, 2-299, 2-300, 2-301, 2-302, 2-303, 2-304, 2-305, 3-001, 3-002, 3-003, 3-004, 3-005, 3-006, 3-007, 3-009, 3-010, 3-011, 3-012, 3-013, 3-014, 3-015, 3-016, 3-017, 3-018, 3-019, 3-020, 3-021, 3-022, 3-023, 3-024, 3-025, 3-026, 3-027, 3-028, 3-029, 3-030, 3-031, 3-032, 3-033, 3-034, 3-035, 3-036, 3-037, 3-038, 3-039, 3-040, 3-041, 3-042, 3-043, 3-044, 3-046, 3-048, 3-049, 3-050, 3-051, 3-052, 3-053, 3-054, 3-055, 3-056, 3-057, 3-058, 3-059, 3-060, 3-061, 3-062, 3-063, 3-064, 3-065, 3-066, 3-067, 3-068, 3-069, 3-070, 3-071, 3-072, 3-073, 3-074, 3-075, 3-076, 3-077,

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Test Example 5: Effect test for kennel ticks

[0234] In 1 ml of acetone, 1 mg of the presently invented compound was dissolved to prepare a chemical solution having a concentration of 1000 ppm. The bottom surface and side surface of each glass container having an inner wall surface area of 25 cm² were coated with 250 µl of the chemical solution, and acetone was then volatilized to form a thin film of the compound on the inner wall of the glass container. Each of the glass containers used had an inner wall of 25 cm², and the amount of the applied chemical was 10 µg/cm².

[0235] Into each of the treated glass containers, five kennel ticks (*Rhipicephalus sanguineus*) protonymphs (mixed-sex) were released, and the glass containers were capped and accommodated in a thermostatic room at 25°C. Two days after the release, the number of dead tick individuals were examined, and the death rate was calculated from the same calculation formula as in Test Example 1.

[0236] The result showed that the following compounds exhibited death rates of 50% or more. The presently invented compound: 1-006, 1-007, 2-120, 2-127, 2-128, 2-151, 2-153, 3-082, 3-100, 3-101, 3-114, 3-128, 3-129, 3-166, 3-186, 3-200, 3-208

Test Example 6: Effect test for cat fleas

[0237] In 1 ml of acetone, 1 mg of the presently invented compound was dissolved to prepare a chemical solution having a concentration of 1000 ppm. The bottom surface and side surface of each glass container having an inner wall surface area of 25 cm² were coated with 250 µl of the chemical solution, and acetone was then volatilized to form a thin film of the compound on the inner wall of the glass container. Each of the glass containers used had an inner wall of 35 cm², and the amount of the applied chemical was 10 µg/cm².

[0238] Into each of the treated glass containers, five cat fleas (*Ctenocephalides felis*) imagoes (mixed-sex) were released, and the glass containers were capped and accommodated in a thermostatic room at 25°C. Three days after the release, the number of dead flea individuals were examined, and the death rate was calculated from the same calculation formula as in Test Example 1.

[0239] The result showed that the following compounds exhibited death rates of 50% or more. The presently invented compound: 1-001, 1-002, 1-003, 1-004, 1-005, 1-006, 1-007, 1-008, 1-009, 1-011, 1-012, 1-014, 1-015, 1-016, 1-017, 1-018, 1-019, 1-020, 1-021, 1-023, 1-024, 2-001, 2-005, 2-008, 2-009, 2-010, 2-011, 2-012, 2-013, 2-014, 2-018, 2-019, 2-020, 2-021, 2-022, 2-024, 2-025, 2-027, 2-028, 2-029, 2-030, 2-031, 2-032, 2-033, 2-034, 2-035, 2-036, 2-037, 2-038, 2-039, 2-040, 2-041, 2-042, 2-044, 2-045, 2-047, 2-049, 2-058, 2-062, 2-063, 2-065, 2-067, 2-068, 2-069, 2-071, 2-072, 2-073, 2-076, 2-077, 2-078, 2-079, 2-080, 2-081, 2-082, 2-083, 2-084, 2-085, 2-086, 2-087, 2-088, 2-089, 2-090, 2-091, 2-092, 2-093, 2-094, 2-095, 2-096, 2-097, 2-098, 2-099, 2-100, 2-101, 2-102, 2-103, 2-104, 2-105, 2-107, 2-108, 2-109, 2-110, 2-111, 2-112, 2-113, 2-114, 2-115, 2-116, 2-117, 2-118, 2-119, 2-120, 2-121, 2-122, 2-123, 2-124, 2-125, 2-126, 2-127, 2-128, 2-129, 2-130, 2-131, 2-132, 2-133, 2-134, 2-135, 2-136, 2-137, 2-138, 2-139, 2-140, 2-141, 2-142, 2-144, 2-145, 2-146, 2-147, 2-148, 2-150, 2-151, 2-152, 2-153, 2-154, 2-155, 2-156, 2-157, 2-158, 2-159, 2-160, 2-161, 2-162, 2-163, 2-164, 2-165, 2-166, 2-167, 2-168, 2-169, 2-170, 2-171, 2-172, 2-173, 2-174, 2-175, 2-176, 2-177, 2-178, 2-179, 2-180, 2-181, 2-182, 2-183, 2-184, 2-186, 2-187, 2-188, 2-189, 2-190, 2-191, 2-192, 2-193, 2-194, 2-195, 2-196, 2-197, 2-198, 2-199, 2-200, 2-201, 2-202, 2-203, 2-204, 2-205, 2-206, 2-207, 2-208, 2-209, 2-211, 2-212, 2-213, 2-214, 2-215, 2-216, 2-217, 2-218, 2-219, 2-220, 2-221, 2-222, 2-223, 2-224, 2-225, 2-226, 2-227, 2-228, 2-229, 2-231, 2-232, 2-233, 2-235, 2-238, 2-240, 2-244, 2-245, 2-246, 2-247, 2-248, 2-249, 2-250, 2-251, 2-252, 2-253, 2-254, 2-255, 2-256, 2-257, 2-259, 2-260, 2-261, 2-263, 2-264, 2-267, 2-269, 2-270, 2-271, 2-272, 2-273, 2-274, 2-275, 2-276, 2-277, 2-278, 2-279, 2-280, 2-282, 2-283, 2-290, 2-297, 2-298, 2-299, 2-300, 2-301, 2-302, 2-303, 2-304, 2-305, 3-001, 3-003, 3-005, 3-006, 3-007, 3-009, 3-010, 3-011, 3-012, 3-013, 3-014, 3-016, 3-018, 3-019, 3-020, 3-021, 3-022, 3-023, 3-024, 3-025, 3-026, 3-027, 3-028, 3-029, 3-030, 3-031, 3-032, 3-033, 3-034, 3-035, 3-036, 3-037, 3-039, 3-040, 3-042,

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Test Example 7: Effect test for *Trichostrongylus axei*

[0240] Agar medium with 1% potato dextrose was aliquoted into 60- μ l portions in a 96-well plate, and 30 μ l of sterilized water containing *Trichostrongylus axei* eggs and a freeze-dried *Escherichia coli* OP50 strain (five eggs, 10 μ g/10 μ l *Escherichia coli*) was added to each well. From above, 10 μ l of test chemical solution B of the presently invented compound was added to each well, and the plate was left to stand under dark conditions at 25°C. The number of unhatched eggs and the number of inactive larvae 4 days after the addition of the chemical were counted, and the efficacy (%) to the untreated plot was calculated from the following expression.

Efficacy (%) = [(number of unhatched eggs in treated plot + number of inactive larvae) / (number of unhatched eggs in untreated plot + number of inactive larvae + number of active larvae)] $\times$ 100

[0241] The result showed that the following compounds among the tested compounds exhibited efficacies (%) of 50% or more.

The presently invented compound: 2-003, 2-035, 2-038, 2-056, 2-070, 2-088, 2-103, 2-115, 2-120, 2-126, 2-128, 2-129, 2-130, 2-131, 2-132, 2-133, 2-136, 2-138, 2-139, 2-142, 2-144, 2-145, 2-147, 2-153, 2-155, 2-156, 2-158, 2-160, 2-161, 2-164, 2-165, 2-166, 2-167, 2-169, 2-170, 2-171, 2-172, 2-173, 2-177, 2-179, 2-180, 2-181, 2-184, 2-188, 2-191, 2-192, 2-193, 2-194, 2-197, 2-201, 2-202, 2-203, 2-204, 2-206, 2-208, 2-211, 2-214, 2-218, 2-219, 2-220, 2-221, 2-225, 2-229, 2-232, 2-234, 2-235, 2-238, 2-239, 2-240, 2-244, 2-245, 2-246, 2-247, 2-248, 2-249, 2-250, 2-251, 2-252, 2-254, 2-255, 2-256, 2-262, 2-263, 2-264, 2-266, 2-270, 2-271, 2-272, 2-273, 2-274, 2-275, 2-277, 2-278, 2-279, 2-289, 2-290, 2-291, 2-292, 2-296, 2-297, 2-299, 2-303, 2-304, 3-011, 3-027, 3-031, 3-060, 3-061, 3-064, 3-065, 3-070, 3-071, 3-074, 3-076, 3-078, 3-082, 3-083, 3-085, 3-086, 3-087, 3-089, 3-097, 3-098, 3-100, 3-102, 3-107, 3-110, 3-114, 3-117, 3-121, 3-124, 3-125, 3-126, 3-127, 3-128, 3-129, 3-136, 3-137, 3-138, 3-139, 3-141, 3-143, 3-144, 3-145, 3-146, 3-148, 3-152, 3-154, 3-155, 3-157, 3-158, 3-161, 3-163, 3-164, 3-166, 3-169, 3-170, 3-171, 3-174, 3-175, 3-180, 3-183, 3-190, 3-192, 3-195, 3-199, 3-202, 3-209, 3-211, 3-216, 3-222, 3-226, 3-232, 3-233, 3-237, 3-239, 3-249, 3-250, 3-261, 3-263, 3-267, 3-268, 3-270, 3-271, 3-274, 3-275, 3-277, 3-279, 3-283, 3-285, 3-293, 5-001, 5-004, 5-005, 5-006, 5-007, 5-009, 5-010, 5-011, 5-012, 5-013, 5-015, 5-016, 6-001

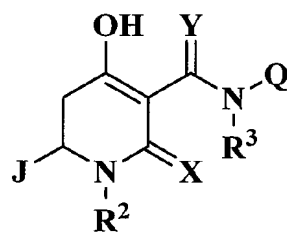
Industrial Applicability

[0242] The aryltetrahydropyridine compound of the present invention or a salt thereof has superior pesticidal activity, and is applicable as a pesticide.

Claims

1. An aryltetrahydropyridine compound or a salt thereof, the aryltetrahydropyridine compound represented by a formula (1):

[Formula 1]

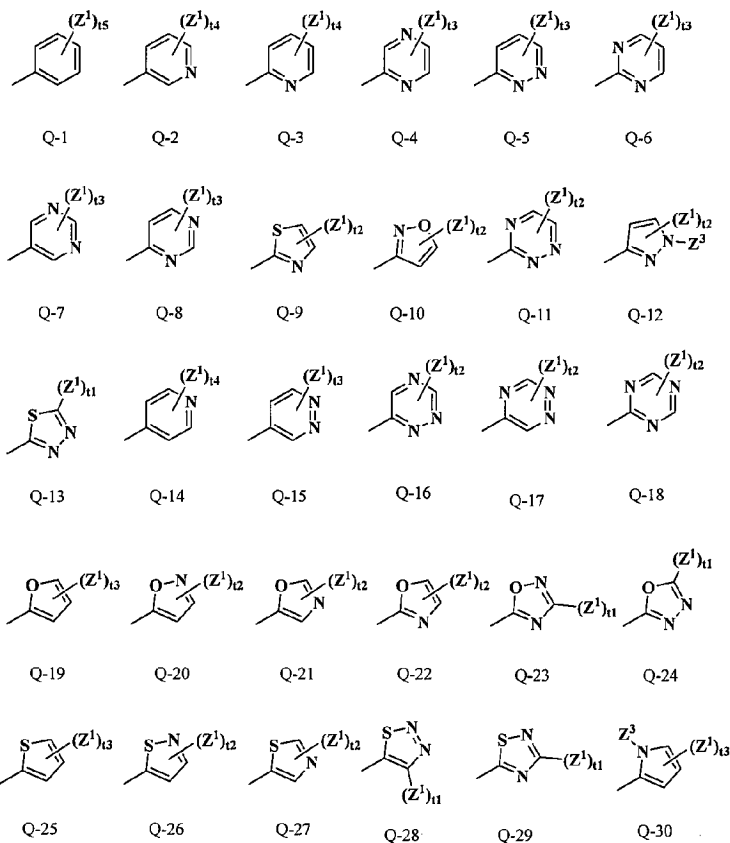


(1)

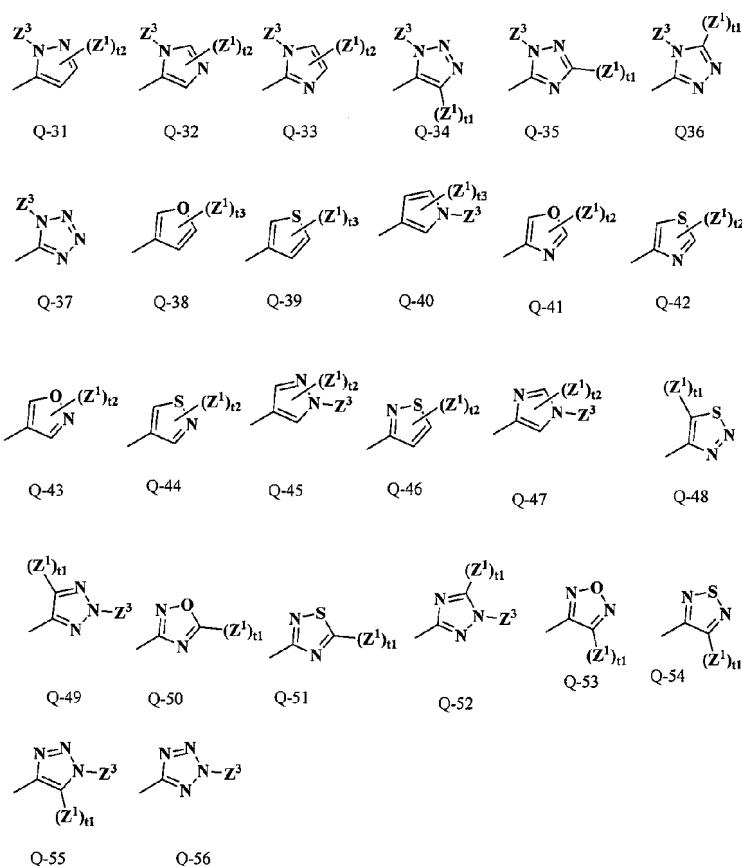
wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-16, Q-17, Q-18, Q-19, Q-20, Q-21, Q-22, Q-23, Q-24, Q-25, Q-26, Q-27, Q-28, Q-29, Q-30, Q-31, Q-32, Q-33, Q-34, Q-35, Q-36, Q-37, Q-38, Q-39, Q-40, Q-41, Q-42, Q-43, Q-44, Q-45, Q-46, Q-47, Q-48, Q-49, Q-50, Q-51, Q-52, Q-53, Q-54, Q-55 or Q-56,

[Formula 2]



[Formula 3]



Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, halo (C₂-C₆) alkenyl, halo (C₂-C₆) alkynyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₂-C₆ alkoxy (C₁-C₆) alkoxy, C₂-C₆ alkenyloxy, halo (C₂-C₆) alkenyloxy, C₂-C₆ alkynyloxy, halo (C₂-C₆) alkynyloxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, C₂-C₆ alkenylthio, C₂-C₆ alkenylsulfinyl, C₂-C₆ alkenylsulfonyl, halo (C₂-C₆) alkenylthio, halo (C₂-C₆) alkenylsulfinyl, halo (C₂-C₆) alkenylsulfonyl, C₂-C₆ alkynylthio, C₂-C₆ alkynylsulfinyl, C₂-C₆ alkynylsulfonyl, halo (C₂-C₆) alkynylthio, halo (C₂-C₆) alkynylsulfinyl, halo (C₂-C₆) alkynylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆) alkylamino, halo (C₁-C₆) alkylamino, dihalo (C₁-C₆) alkylamino, formyl, carboxy, C₁-C₆ alkylcarbonyl, halo (C₁-C₆) alkylcarbonyl, C₁-C₆ alkoxy carbonyl, halo (C₁-C₆) alkoxy carbonyl, C₁-C₆ alkylaminocarbonyl, halo (C₁-C₆) alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, hydroxy, C₁-C₆ alkylcarbonyloxy, C₁-C₆ alkoxy carbonyloxy, C₁-C₆ alkylsulfonyloxy, halo (C₁-C₆) alkylsulfonyloxy, -SO₃H, C₁-C₆ alkylaminosulfonyl, di (C₁-C₆) alkylaminosulfonyl, -C(=NOR¹²)R¹³, cyano or nitro,

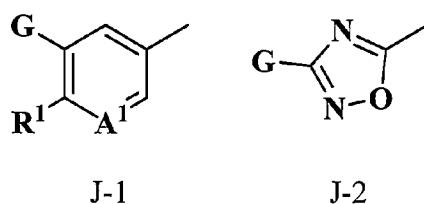
R¹² represents a hydrogen atom or C₁-C₆ alkyl,

R¹³ represents a hydrogen atom or C₁-C₆ alkyl,

Z³ represents a hydrogen atom or C₁-C₆ alkyl,

J represents J-1 or J-2,

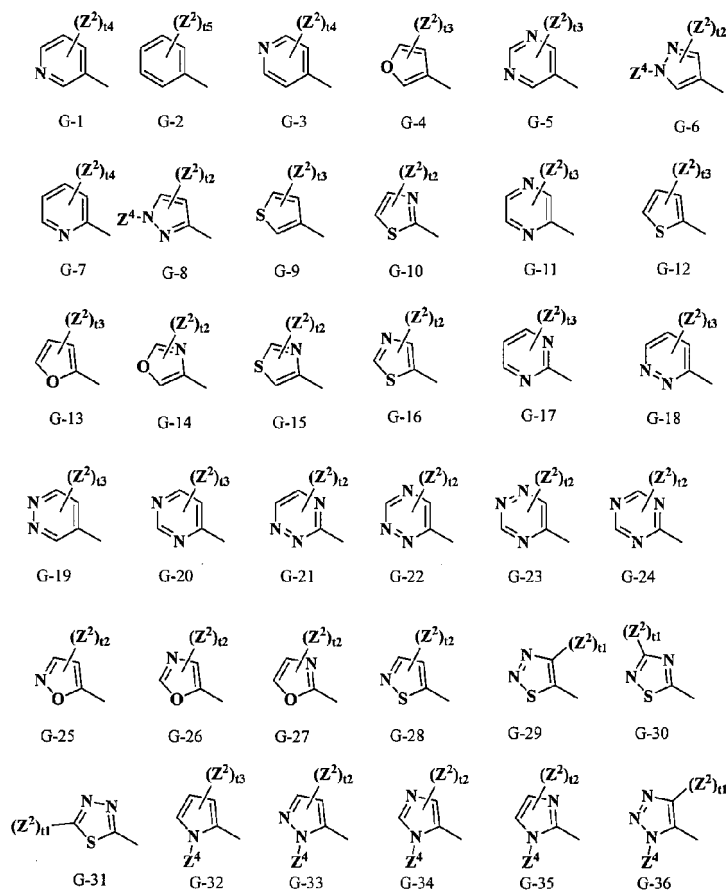
[Formula 4]



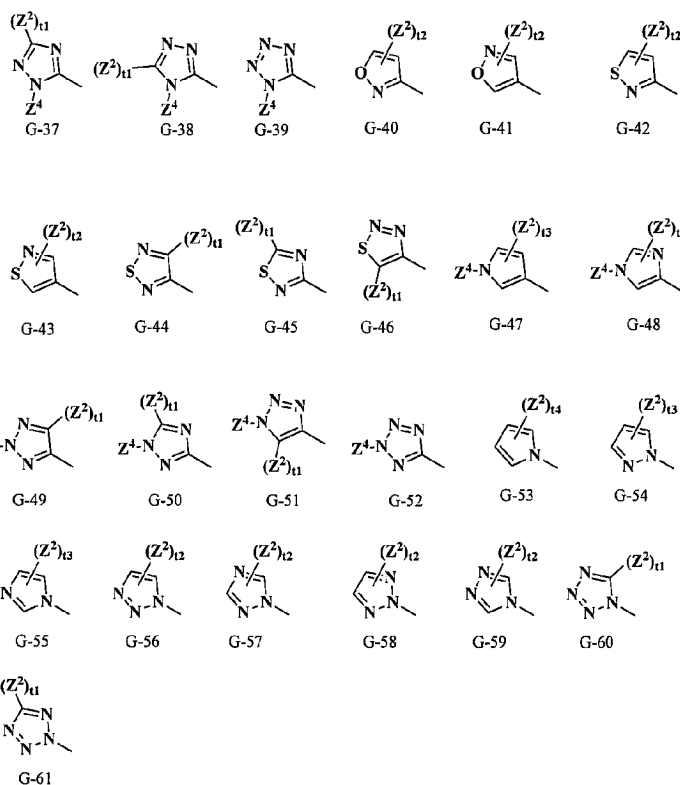
A¹ represents a nitrogen atom or CH,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-36, G-37, G-38, G-39, G-40, G-41, G-42, G-43, G-44, G-45, G-46, G-47, G-48, G-49, G-50, G-51, G-52, G-53, G-54, G-55, G-56, G-57, G-58, G-59, G-60 or G-61,

[Formula 5]



[Formula 6]



Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, halo (C₂-C₆) alkenyl, halo (C₂-C₆) alkynyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkoxy (C₁-C₆) alkoxy, C₂-C₆ alkenyloxy, halo (C₂-C₆) alkenyloxy, C₂-C₆ alkynyloxy, halo (C₂-C₆) alkynyloxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, C₂-C₆ alkenylthio, C₂-C₆ alkenylsulfinyl, C₂-C₆ alkenylsulfonyl, halo (C₂-C₆) alkenylthio, halo (C₂-C₆) alkenylsulfinyl, halo (C₂-C₆) alkenylsulfonyl, C₂-C₆ alkynylthio, C₂-C₆ alkynylsulfinyl, C₂-C₆ alkynylsulfonyl, halo (C₂-C₆) alkynylthio, halo (C₂-C₆) alkynylsulfinyl, halo (C₂-C₆) alkynylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆) alkylamino, halo (C₁-C₆) alkylamino, dihalo (C₁-C₆) alkylamino, formyl, carboxy, C₁-C₆ alkylcarbonyl, halo (C₁-C₆) alkylcarbonyl, C₁-C₆ alkoxy carbonyl, halo (C₁-C₆) alkoxy carbonyl, C₁-C₆ alkylaminocarbonyl, halo (C₁-C₆) alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, hydroxy, C₁-C₆ alkylcarbonyloxy, C₁-C₆ alkoxy carbonyloxy, C₁-C₆ alkylsulfonyloxy, halo (C₁-C₆) alkylsulfonyloxy, -SO₃H, C₁-C₆ alkylaminosulfonyl, di (C₁-C₆) alkylaminosulfonyl, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

R¹⁴ represents a hydrogen atom or C₁-C₆ alkyl,

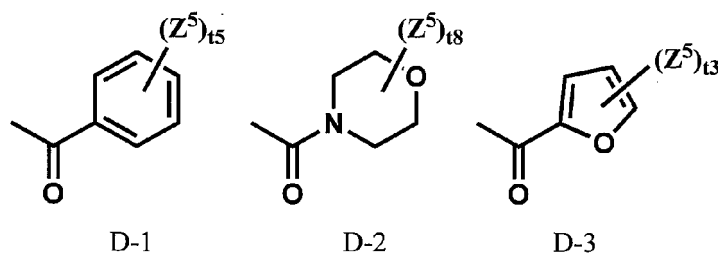
R¹⁵ represents a hydrogen atom or C₁-C₆ alkyl,

Z⁴ represents C₁-C₆ alkyl,

R¹ represents a hydrogen atom, a halogen atom, halo (C₁-C₆) alkyl, C₁-C₆ alkyl or cyano,

R² represents a hydrogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, -C(O)R⁴, -C(O)OR⁵, D-1, D-2 or D-3,

[Formula 7]



R⁴ represents C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, C₁-C₆ alkylcarbonyl, di (C₁-C₆) alkylamino or (C₁-C₆) alkyl substituted with R⁶,

R⁶ represents a halogen atom, C₁-C₆ alkoxy, cyano, nitro, phenyl or phenyl substituted with R⁸,
 Z⁵ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,
 R⁸ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,
 R⁵ represents C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl, (C₁-C₆) alkyl substituted with R⁹,
 phenyl or phenyl substituted with R¹⁰,
 R⁹ represents a halogen atom, C₁-C₆ alkoxy, cyano, nitro, phenyl or phenyl substituted with R¹¹,
 R¹⁰ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,
 R¹¹ represents a halogen atom, C₁-C₆ alkyl, C₁-C₆ alkoxy, cyano or nitro,
 R³ represents a hydrogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₆ cycloalkyl or
 C₁-C₆ alkylcarbonyl,
 X represents an oxygen atom or a sulfur atom,
 Y represents an oxygen atom or a sulfur atom,
 t1 represents an integer of 0 or 1,
 t2 represents an integer of 0, 1 or 2,
 t3 represents an integer of 0, 1, 2 or 3,
 t4 represents an integer of 0, 1, 2, 3 or 4,
 t5 represents an integer of 0, 1, 2, 3, 4 or 5 and
 t8 represents an integer of 0, 1, 2, 3 or 4.

2. The aryltetrahydropyridine compound according to claim 1 or a salt thereof, wherein
 A¹ represents a nitrogen atom.

3. The aryltetrahydropyridine compound according to any one of claims 1 to 2 or a salt thereof, wherein

Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo
 (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, halo (C₁-C₆)
 alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆) alkylamino, carboxy, C₁-C₆ alkylcar-
 bonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, di (C₁-C₆) alkylaminocarbonyl, hydroxy, C₁-C₆ alkyl-
 carbonyloxy, C₁-C₆ alkylsulfonyloxy, cyano or nitro,
 Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, halo (C₂-C₆) alkenyl,
 halo (C₂-C₆) alkynyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl,
 halo (C₁-C₆) alkylthio, halo (C₁-C₆) alkylsulfinyl, halo (C₁-C₆) alkylsulfonyl, -NH₂, C₁-C₆ alkylamino, di (C₁-C₆)
 alkylamino, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, di (C₁-C₆) alkyl-
 aminocarbonyl, hydroxy, C₁-C₆ alkylcarbonyloxy, C₁-C₆ alkylsulfonyloxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,
 Z⁵ represents a halogen atom, C₁-C₆ alkyl or C₁-C₆ alkoxy,
 R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,
 R² represents a hydrogen atom, -C(O)R⁴, -C(O)OR⁵, D-1, D-2 or D-3,
 R³ represents a hydrogen atom,
 Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-16, Q-17, Q-18,
 Q-19, Q-20, Q-21, Q-22, Q-23, Q-25, Q-26, Q-27, Q-29, Q-30, Q-31, Q-32, Q-33, Q-38, Q-39, Q-40, Q-41, Q-42,
 Q-43, Q-44, Q-45, Q-46, Q-47, Q-50, Q-51, Q-52 or Q-54, and
 G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18,
 G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-33, G-34, G-35, G-37,
 G-38, G-40, G-41, G-42, G-43, G-45, G-47, G-48, G-50, G-53, G-54, G-55 or G-57.

4. The aryltetrahydropyridine compound according to any one of claims 1 to 3 or a salt thereof, wherein

J represents J-1, and
 A¹ represents a nitrogen atom.

5. The aryltetrahydropyridine compound according to any one of claims 1 to 3 or a salt thereof, wherein
 J represents J-2.

6. The aryltetrahydropyridine compound according to any one of claims 1 to 5 or a salt thereof, wherein
 G represents G-1, G-3, G-4, G-5, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21,
 G-22, G-23, G-24, G-25, G-26, G-27, G-28, G-29, G-30, G-31, G-32, G-34, G-35, G-37, G-38, G-40, G-41, G-42, G-43,
 G-45, G-47, G-48, G-50, G-53, G-55 or G-57.

7. The aryltetrahydropyridine compound according to claim 1 or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29, Q-31, Q-45 or Q-52,

Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, hydroxy, cyano or nitro,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28 or G-40,

Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, di (C₁-C₆) alkylamino, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, hydroxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

R¹⁴ represents C₁-C₆ alkyl,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R² represents a hydrogen atom, -C(O)R⁴, -C(O)OR⁵, D-1, D-2 or D-3,

R⁴ represents C₁-C₆ alkyl, C₃-C₆ cycloalkyl, C₁-C₆ alkylcarbonyl or (C₁-C₆) alkyl substituted with R⁶,

R⁶ represents a halogen atom or C₁-C₆ alkoxy,

Z⁵ represents C₁-C₆ alkyl,

R⁵ represents C₁-C₆ alkyl or C₂-C₆ alkenyl,

R³ represents a hydrogen atom, and

X represents an oxygen atom.

8. The aryltetrahydropyridine compound according to claim 7 or a salt thereof, wherein

G represents G-1, G-3, G-4, G-5, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28 or G-40.

9. The aryltetrahydropyridine compound according to claim 8 or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29 or Q-45,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, C₁-C₆ alkoxycarbonyl, cyano or nitro,

Z³ represents C₁-C₆ alkyl, and

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, hydroxy, nitro or cyano.

10. The aryltetrahydropyridine compound according to claim 9 or a salt thereof, wherein

J represents J-1,

A¹ represents a nitrogen atom,

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-12, Q-13, Q-14 or Q-22,

G represents G-1, G-3, G-4 or G-5,

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy or nitro,

R² represents a hydrogen atom or -C(O)OR⁵,

R⁵ represents C₁-C₆ alkyl, and

Y represents an oxygen atom.

11. The aryltetrahydropyridine compound according to claim 10 or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, cyano or nitro,

G represents G-1 or G-3,

Z² represents a halogen atom, C₁-C₆ alkyl or halo (C₁-C₆) alkyl,

R¹ represents a halogen atom or halo (C₁-C₆) alkyl, and

R² represents a hydrogen atom.

12. The aryltetrahydropyridine compound according to claim 9 or a salt thereof, wherein

J represents J-2,

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9, Q-10, Q-12, Q-20, Q-29 or Q-45,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, C₁-C₆ alkoxycarbonyl, cyano or nitro,
G represents G-1, G-3, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-27, G-28
or G-40, and

Z² represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl,
C₁-C₆ alkylsulfonyl or hydroxy.

13. The aryltetrahydropyridine compound according to claim 12 or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6, Q-9 or Q-12,

Z¹ represents a halogen atom, C₁-C₆ alkyl, halo (C₁-C₆) alkyl, cyano or nitro,

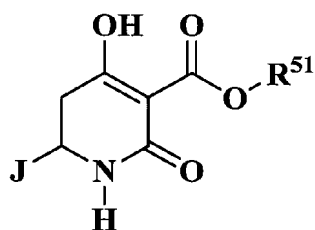
G represents G-1, G-3 or G-7,

Z² represents a halogen atom, C₁-C₆ alkyl or halo (C₁-C₆) alkyl, and

R² represents a hydrogen atom.

14. A production intermediate for the aryltetrahydropyridine compound according to any one of claims 1 to 13 or a salt thereof, the production intermediate represented by a formula (1-1):

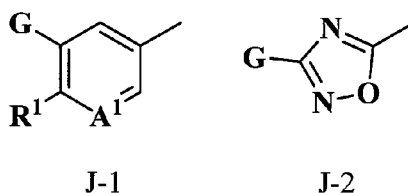
[Formula 8]



(1-1)

wherein J represents J-1 or J-2,

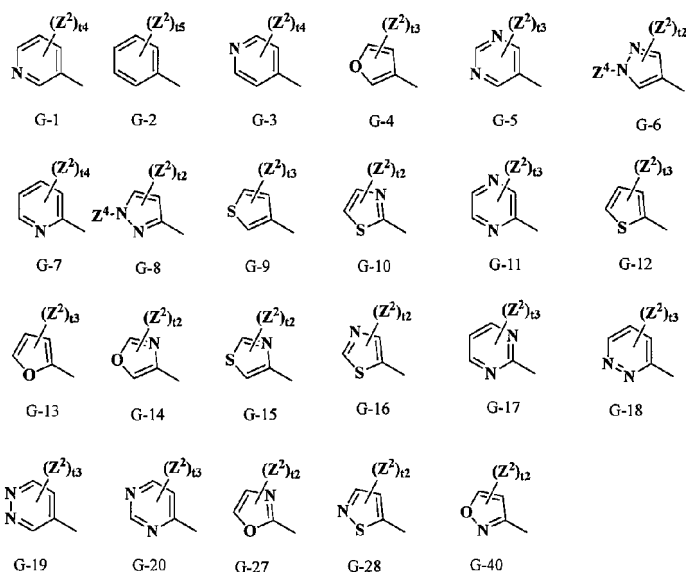
[Formula 9]



A¹ represents a nitrogen atom,

G represents G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18,
G-19, G-20, G-27, G-28 or G-40,

[Formula 10]



Z² represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, di (C₁-C₆) alkylamino, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxy carbonyl, hydroxy, -C(=NOR¹⁴)R¹⁵, nitro or cyano,

R¹⁴ represents C₁-C₆ alkyl,

R¹⁵ represents a hydrogen atom or C₁-C₆ alkyl,

Z⁴ represents C₁-C₆ alkyl,

R¹ represents a hydrogen atom, a halogen atom or halo (C₁-C₆) alkyl,

R⁵¹ represents C₁-C₆ alkyl,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4, and

t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

15. The production intermediate according to claim 14 for the aryltetrahydropyridine compound or a salt thereof, wherein

J represents J-1,

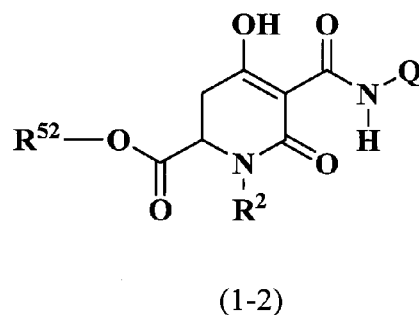
G represents G-1, G-2 or G-3,

Z² represents a halogen atom or C₁-C₆ alkyl, and

R¹ represents a halogen atom or halo (C₁-C₆) alkyl.

16. A production intermediate for the aryltetrahydropyridine compound according to any one of claims 1 to 13 or a salt thereof, the production intermediate represented by a formula (1-2):

[Formula 11]



wherein R⁵² represents a hydrogen atom or C₁-C₆ alkyl,

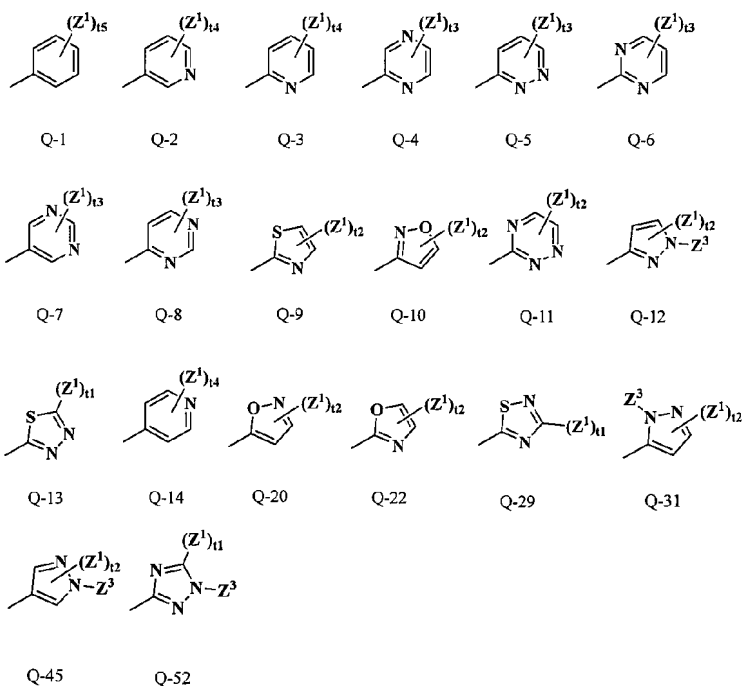
R² represents a hydrogen atom, -C(O)R⁴ or -C(O)OR⁵,

R⁴ represents C₁-C₆ alkyl,

R⁵ represents C₁-C₆ alkyl,

Q represents Q-1, Q-2, Q-3, Q-4, Q-5, Q-6, Q-7, Q-8, Q-9, Q-10, Q-11, Q-12, Q-13, Q-14, Q-20, Q-22, Q-29, Q-31, Q-45 or Q-52,

[Formula 12]



Z¹ represents a halogen atom, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, halo (C₁-C₆) alkyl, C₁-C₆ alkoxy, halo (C₁-C₆) alkoxy, C₁-C₆ alkylthio, C₁-C₆ alkylsulfinyl, C₁-C₆ alkylsulfonyl, halo (C₁-C₆) alkylthio, carboxy, C₁-C₆ alkylcarbonyl, C₁-C₆ alkoxycarbonyl, C₁-C₆ alkylaminocarbonyl, hydroxy, cyano or nitro,

Z³ represents a hydrogen atom or C₁-C₆ alkyl,

t₁ represents an integer of 0 or 1,

t₂ represents an integer of 0, 1 or 2,

t₃ represents an integer of 0, 1, 2 or 3,

t₄ represents an integer of 0, 1, 2, 3 or 4, and

t₅ represents an integer of 0, 1, 2, 3, 4 or 5.

17. The production intermediate according to claim 16 for the aryltetrahydropyridine compound or a salt thereof, wherein

Q represents Q-1, Q-2, Q-3, Q-4, Q-6 or Q-9,

Z¹ represents a halogen atom, C₁-C₆ alkyl or cyano, and

R² represents a hydrogen atom or -C(O)OR⁵.

18. A pesticide comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an active ingredient.

19. An agrochemical comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an active ingredient.

20. A control agent for an internal or external parasite in a mammal or a bird, the control agent comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an

active ingredient.

21. The control agent according to claim 20, wherein the external parasite is a species belonging to Siphonaptera or a species belonging to Acari.

22. An insecticide or acaricide comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an active ingredient.

23. An agent for seed treatment, the agent comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an active ingredient.

24. The agent for seed treatment according to claim 23, wherein the seed treatment is performed by soaking.

25. An agent for soil treatment, the agent comprising one or two or more selected from the aryltetrahydropyridine compound according to any one of claims 1 to 13 and salts thereof as an active ingredient.

26. The agent for soil treatment according to claim 25, wherein the soil treatment is performed by soil drenching.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/032082

A. CLASSIFICATION OF SUBJECT MATTER

C07D 211/84(2006.01)i; A01N 43/40(2006.01)i; A01N 43/54(2006.01)i; A01N 43/56(2006.01)i; A01N 43/58(2006.01)i; A01N 43/60(2006.01)i; A01N 43/836(2006.01)i; A01N 53/12(2006.01)i; A01P 5/00(2006.01)i; A01P 7/04(2006.01)i; A61K 31/4418(2006.01)i; A61K 31/4427(2006.01)i; A61K 31/443(2006.01)i; A61K 31/4436(2006.01)i; A61K 31/4439(2006.01)i; A61K 31/444(2006.01)i; A61K 31/497(2006.01)i; A61K 31/501(2006.01)i; A61K 31/506(2006.01)i; A61P 33/00(2006.01)i; A61P 33/02(2006.01)i; A61P 33/10(2006.01)i; A61P 33/14(2006.01)i; A61P 43/00(2006.01)i; C07D 211/90(2006.01)i; C07D 401/04(2006.01)i; C07D 401/10(2006.01)i; C07D 401/12(2006.01)i; C07D 401/14(2006.01)i; C07D 403/12(2006.01)i; C07D 405/10(2006.01)i; C07D 405/12(2006.01)i; C07D 405/14(2006.01)i; C07D 413/04(2006.01)i; C07D 413/14(2006.01)i; C07D 417/12(2006.01)i; C07D 417/14(2006.01)i

FI: C07D211/84; A01N43/40 101Q; A01N43/54 A; A01N43/54 B; A01N43/56 B; A01N43/56 C; A01N43/58 A; A01N43/60; A01N43/836; A01N53/12; A01P5/00; A01P7/04; A61K31/4418; A61K31/4427; A61K31/443; A61K31/4436; A61K31/4439; A61K31/444; A61K31/497; A61K31/501; A61K31/506; A61P33/00; A61P33/02 171; A61P33/10; A61P33/14; A61P43/00 171; C07D211/90 CSP; C07D401/04; C07D401/10 CSP; C07D401/12; C07D401/12 CSP; C07D401/14; C07D403/12; C07D405/10; C07D405/12; C07D405/14; C07D413/04; C07D413/14; C07D417/12; C07D417/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C07D211/84; A01N43/40; A01N43/54; A01N43/56; A01N43/58; A01N43/60; A01N43/836; A01N53/12; A01P5/00; A01P7/04; A61K31/4418; A61K31/4427; A61K31/443; A61K31/4436; A61K31/4439; A61K31/444; A61K31/497; A61K31/501; A61K31/506; A61P33/00; A61P33/02; A61P33/10; A61P33/14; A61P43/00; C07D211/90; C07D401/04; C07D401/10; C07D401/12; C07D401/14; C07D403/12; C07D405/10; C07D405/12; C07D405/14; C07D413/04; C07D413/14; C07D417/12; C07D417/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CAplus/REGISTRY (STN)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2021/261562 A1 (NIHON NOHYAKU CO., LTD.) 30 December 2021 (2021-12-30) claims, table 1, compound no. 1-61, etc., examples, test examples	1-26

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915
Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/032082

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2009-544733 A (NOVARTIS AG) 17 December 2009 (2009-12-17) claims, examples	1-26
A	ASHTON, Michael J. et al., Synthesis of 6-aryl-4-hydroxypiperidin-2-ones and a possible application to the synthesis of a novel HMG-CoA reductase inhibitor, Heterocycles, 1989, 28(2), pp. 1015-1035 p. 1017, Scheme 1, compound 9g	1-26
P, A	WO 2023/127806 A1 (NIPPON NOHYAKU CO., LTD.) 06 July 2023 (2023-07-06) claims, examples, compound no. 3-74, 3-75	1-26

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2023/032082

5	Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
10	WO 2021/261562 A1	30 December 2021	EP 4174056 A1 claims, table 1, compound no. 1-61, etc., examples, test examples BR 112022025816 A CN 115916752 A TW 202216666 A	
15	JP 2009-544733 A	17 December 2009	US 2009/0203694 A1 claims, examples WO 2008/014311 A2 EP 2049103 A2 CA 2658558 A KR 10-2009-0034395 A CN 101516365 A RU 2009106214 A AU 2007276808 A MX 2009000944 A BR P10715112 A	
25	WO 2023/127806 A1	06 July 2023	(Family: none)	
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REFERENCES CITED IN THE DESCRIPTION

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